ELECTRICAL REVIEW

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26 FEBRUARY 1954

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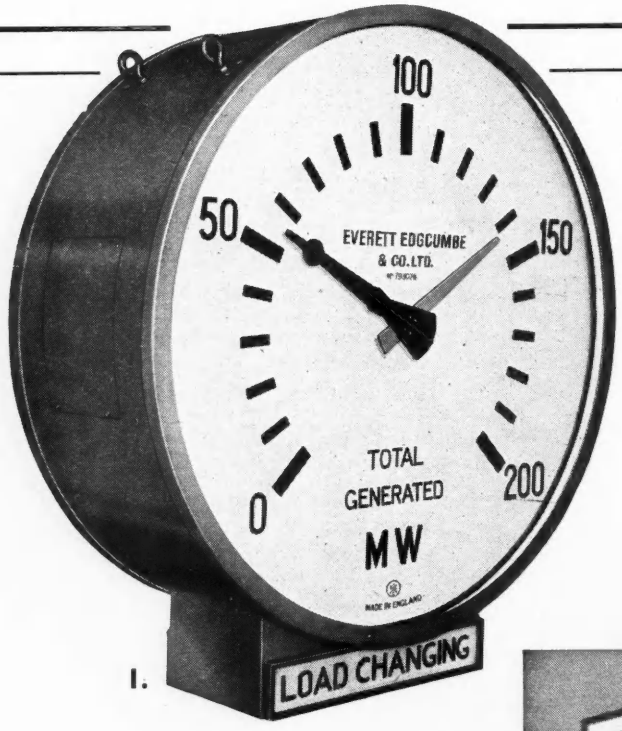
Telemetering and Remote Indication



1.

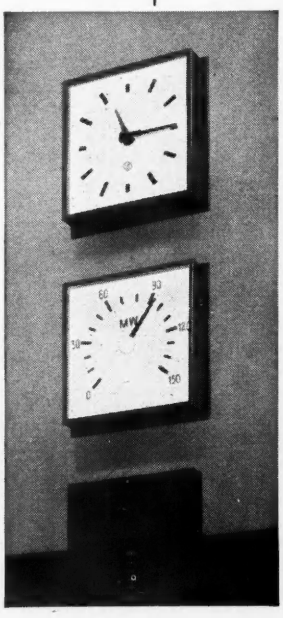
Everett Edgcumbe design and make Summation and Telemetering Equipment for load and other indications.

Each scheme is individually engineered and the method used, either electronic or electro-mechanical, is chosen to suit circumstances.

In some cases the complete circuit, including the giant indicators, has no contacts.

For Master Frequency indication and control see Cat. Sheet 197A.

2.



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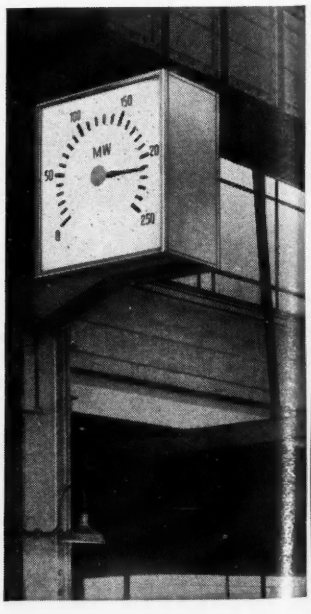

The illustrations show some typical remote indicators—they may be either direct or Servo operated.

1. 40″ Diameter illuminated double sided summation indicator with remote controlled impending load pointer.

2. Turbine Room load indicator and clock in 4′ 0″ square illuminated cases.

3. 4′ 0″ square double sided illuminated total load indicator.

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ELECTRICAL REVIEW

26 February 1954 Vol. 154 No. 9 Established 1872

Very High Load Density

IN this issue we publish an article which describes the transmission and distribution structure which has been designed and developed over the years for handling the extremely heavy loads which have to be met in the area of the London Electricity Board. It shows in the main what has been, and is being, done primarily to sustain the very heavy loads built up in the area in the past and, secondly, to meet the present much increased demand and to provide for the future. This requires the exercise of much intelligent anticipation of how things are likely to develop both in " shape and size." On the whole the article indicates the growth which has taken place since we dealt similarly with the transmission and distribution systems in roughly the same area in the *Electrical Review* of 24th January and 7th February, 1947—two articles of our London load building series of about that time. The maximum demand in the area rose from 1,320 MW in 1947 to 1,623 MW in 1953, an increase of about 20 per cent. In the same period, however, the power supplied in the area increased from 3,200 million kWh to 4,886 million, representing an advance of about 50 per cent.

But behind all this is an aspect which we particularly wish to stress here, namely, that the load density represented is far beyond what is generally considered to be high load density in the rest of the country. When we were carrying out our investigations for the 1947 articles we were told authoritatively that it was unlikely that any other place in the world, with the possible exception of a small part of New York, could compare with the London area for extremely high load density. The truth of this was brought home to us again when we prepared the " National Supply Survey " articles covering the fourteen Electricity Areas soon after the nationalization of the electricity supply industry, and once more in connection with the " Generation in Great Britain " article published in the *Electrical Review* of 5th June last year. In preparing our map depicting the general position throughout the country we selected as a background four load densities, the maximum of which was above 1,000 kW per square mile. Although the four density figures we chose did actually give in simple terms a general picture throughout the country as a whole, we had to face the fact that for the whole of the London area the load density was at least four times greater than our maximum figure; indeed on a district basis the load density figure in London has, for a long time, been up to and over the 100,000 kVA per square mile mark. This is the case in the St. James's area of about a quarter of a square mile, while the badly bombed City of London—the " One Square Mile "—at the moment runs St. James's a close second. The conditions we have tried to emphasize are reflected in the extremely close spacing of the transformer chambers in order to deal with the very concentrated loads; in some districts the points are as little as 150 yards apart.

AMALGAMATION OF DIVISIONS

Decentralization of the electricity supply industry is generally held to be desirable, but this has seemed to apply less to the generating branch than to distribution and sales. The Generating Divisions are direct agents of the British Electricity Authority and, through the grid, are members one of another. On the other hand, the Electricity Boards are in a large measure independent bodies. Under the Electricity Reorganization (Scotland) Bill the B.E.A. is to lose control of the two Scottish Divisions, which will be merged with the present Area Boards to form the new South of Scotland Electricity Board, responsible for both generation and distribution. Now, it is announced, the number of Divisions is to be reduced still further by the amalgamation of the North Western and the Merseyside and North Wales Divisions as from 1st April. This does not appear to be a move towards decentralization, but in fact it is, for the B.E.A. says that the new Division will be given increased responsibility for its operations " in pursuance of the Authority's declared policy of decentralization." The amalgamation is in the nature of an experiment upon the results of which future action will be decided.

CASE FOR THE TROLLEY-BUS

It is so much easier to provide an oil-engine bus service that most transport authorities nowadays are content to ignore the very strong arguments in favour of trolley-buses. Therefore it is necessary for the electrical industry to present these arguments to those responsible for passenger transport as often as possible. The Trolley-bus and Tramways Committee of the Electrical Development Association is assiduous in this matter and so is the British Electrical and Allied Manufacturers' Association. From the latter body we have received its latest Information Sheet on the subject (No. 5) in which is stressed the risk of relying so heavily on imported fuel for transport operation. All the other points (and there are many) in favour of the trolley-bus are set out in an article by Mr. C. T. Humpidge, general manager, Bradford City Transport. Bradford has been operating trolley-buses for forty-two years now with entire satisfaction and the system has been studied by many overseas visitors—no doubt with beneficial effects upon our export trade in these vehicles. This may be considered an extraneous point by transport authorities but it is one of some importance.

LIFE AND RELIABILITY

In last week's " Letter from America," broadcast in the B.B.C. Home Service, in which Alistair Cook had something to say on American appliances, he referred principally to electrical equipment and said that a great deal of ingenuity was put into design and sale but, following the general American practice, appliances were not made to last. The idea was to sell the customer something bigger and better after a comparatively short period of use. Attempts to have appliances repaired were met by rebuffs and delays all round until, in desperation, the customer succumbed to the salesman's blandishments. That was not to say that American equipment was unsatisfactory or unsafe. The buyer was protected by two active organizations which tested and reported on all kinds of merchandise. Mr. Cook drew the moral from all this that British manufacturers were unlikely to succeed in the United States by claiming inordinately long life for their products. This rather goes against the tenet that British goods can only make headway in America if they are of superior workmanship and reliability. No doubt much depends on the particular class. While small domestic appliances may be cheerfully replaced after a few months this could hardly apply to power plant or other expensive equipment.

COLLIERY REFUSE AS FUEL

Owing to the large proportion of the coal mined that is treated for the market at the extensive yet compact and rapidly developing coalfield in Lorraine, this area is especially favourable to success in the burning of washery slurry for the generation of electricity. The scale of operation there is indicated in the I.E.E. paper reviewed in this issue by the 600 MW (ultimate) capacity of the generating plant required, which is ten times that of the power station to be built by the British Electricity Authority for using colliery waste at Barony, Ayrshire. The decision to install 100 MW sets with appropriately high steam conditions was a bold one, but a cautious initial approach is illustrated by the provision of four boilers for each of the earlier turbo-alternators. Confidence in the outcome is apparent, however, in the decision to use one large boiler only for each of the later units. Transport of slurry by pipeline presented the most difficult problems, but these seem to have been satisfactorily solved.

INSTITUTION PAPERS

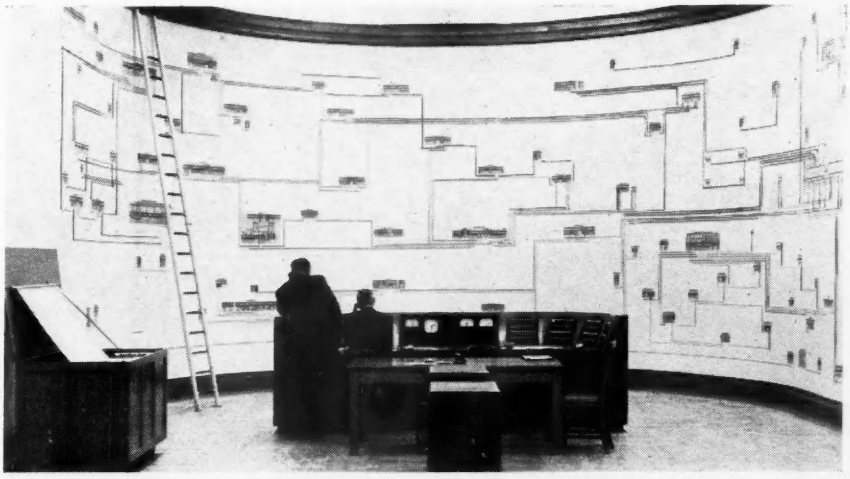
While specialization in one or other of the many fields of electrical science and technology is to-day inevitable, it is also essential to preserve a balanced outlook by relating each individual sphere of activity to the whole. A most valuable service rendered by the Institution of Electrical Engineers lies in arranging for the presentation of papers concerning engineering practice and achievements. These papers are not mere descriptions; they are long enough to discuss the background of the problems which they introduce. On the other hand short contributions dealing with practical operating matters or limited aspects of wide subjects, which are called for in a statement of policy by the I.E.E. Council in the February issue of the I.E.E. *Journal*, could hardly present this background and would thus tend to destroy the perspective which the others create. They seem likely better to meet the needs of technicians than of professional engineers.

KETTLES AND COFFEE PERCOLATORS

Continuing our survey of domestic electrical appliances we shall next week be dealing with kettles and coffee percolators

LONDON LOAD HANDLING

Distribution in an Area of High Load Density



The main control centre of the London Board distribution systems at Valley Road, Streatham

THE generation background to the supply of electricity in the London area was outlined in an article in the *Electrical Review* of 3rd January, 1947, and a further article, in the issue of 24th January, 1947, showed how the load from the power stations was transmitted in bulk to the key points in the central part of the area for distribution to the consumers.

Only the networks at 66 kV and 22 kV of the former London Power Company and its constituent companies were described, although, as many of our readers are aware, there existed in London not inconsiderable complementary networks, at 33 kV and 22 kV, provided and operated by the former County of London Electric Supply Company and its associated companies, and by the Woolwich Borough Council Electricity Department.

The formation of the London Electricity Board, in 1948, presented the opportunity to attempt some rationalization, which many technical men had long forecast as being desirable. Mr. Hamlyn Dennis, in the *Electrical Review* of 30th July, 1943, and Mr. E. H. Jesty in the issue of 20th August, 1943, had suggested larger distribution areas formed by the grouping of the then existing undertakings. This was achieved by the Electricity Act, 1947, when the London Board was created to operate, from 1st April, 1948, the distribution assets in the London area of eleven companies and thirty municipal electricity undertakings.

One of the most difficult and complicated of the Board's planning problems and at the same time one of the most important from the point of view of coping with the growing load, and one of the most attractive from the standpoint of doing this with the minimum of capital expenditure, lay in making the best use, technically, of these formerly unrelated transmission networks.

The County of London Group had a capital substation and system control at Valley Road, Streatham, and it was a fortunate circumstance that many of the control channels of the former London Power Company's system could be picked up and diverted to Valley Road at reasonable expense. This centre has now been constituted "London Distribution Control" and can exercise direct control over the Board's transmission networks. The aggregate maximum demand on the systems has increased, in the five years since vesting day, from 1,218 MW to 1,623 MW and annual sales have increased from 3,655 to 4,886 million kWh.

Naturally, the Board inherited a legacy of plans for expansion, but they had all been conceived upon a much more restricted scale than that which may now be used and they had to be "tailored," in some cases by the very individuals who had originated them, to make the best use of the assets in the light of the new conditions. It now has become possible to supply certain new major substations needed by the growing load in areas formerly supplied by one company, from power stations which were formerly in the ownership of another, unrelated, company, and thus to achieve very large economy in capital outlay and substantial annual savings on transmission.

In the 1947 articles the subject was treated largely historically, so as to emphasize the evolutionary aspect of the Power Company's policy and the events which led to its formation. The Electricity Act, 1947, brought a revolutionary aspect of the subject into prominence and the best way to consider the subsequent developments is geographical, rather than historical. For the first five years the Board operated a "three-tier" structure of Headquarters, Sub-Areas and Districts, and has only recently announced its intention of reorganizing into a "two-tier" structure with the abolition of Sub-Areas as engineering units.

It will be convenient, then, to consider the accomplishments territorially, by Sub-Areas, although the conception, construction and operation of all transmission projects, indeed, all work above 11 kV, has been the direct concern of the chief engineer's Headquarters organization.

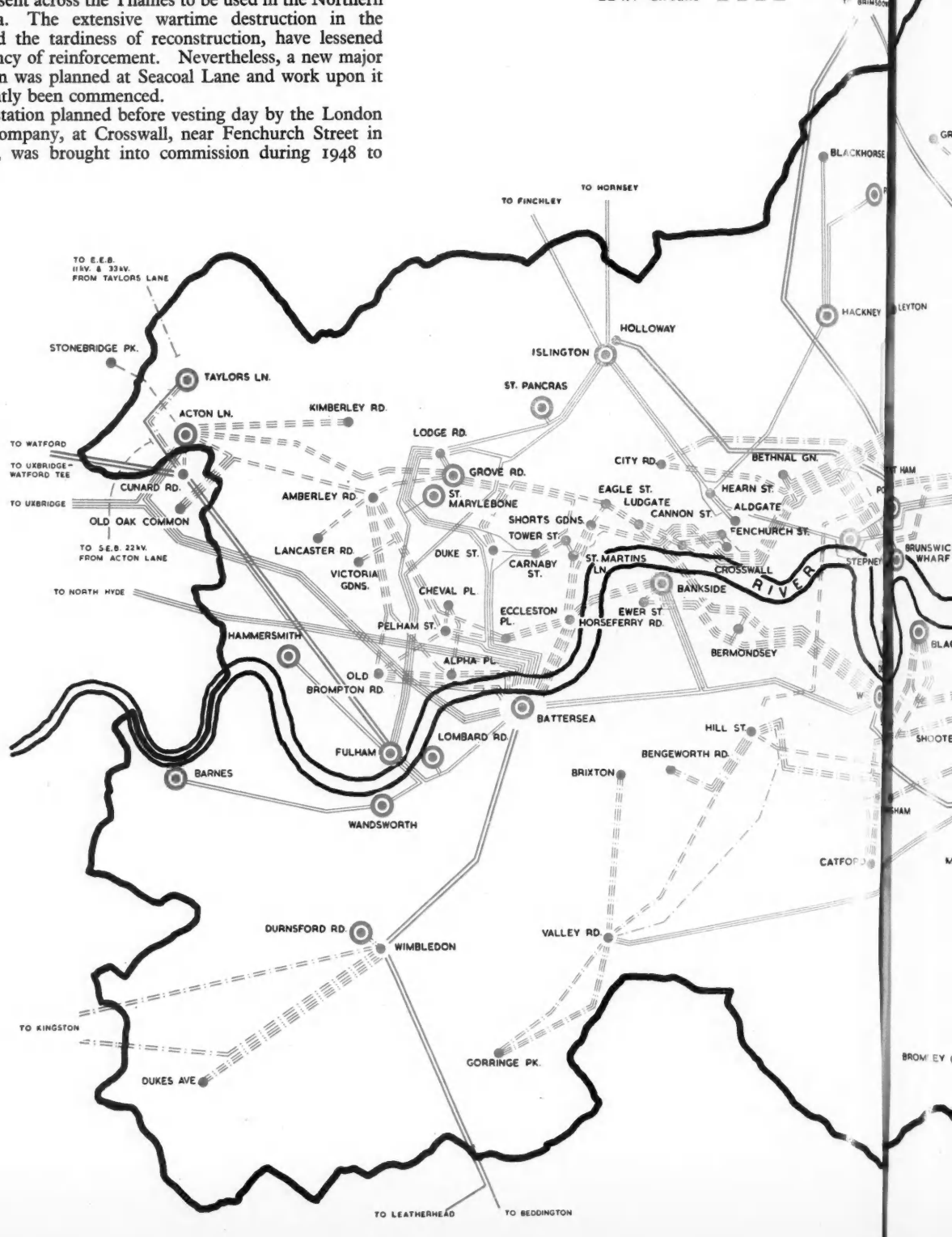
From the earliest days of the Board's existence the

closest liaison with the Generation Division of the Central Authority has been maintained. At joint planning meetings strategy has been worked out and it is a tribute to the knowledge and skill of the planners that there has been so much agreement between the original desirable plans and the tactical moves which have been possible.

Northern Sub-Area

Although the old Bankside power station is situated on the South Bank, a very large part of its output to the Board is sent across the Thames to be used in the Northern Sub-Area. The extensive wartime destruction in the City, and the tardiness of reconstruction, have lessened the urgency of reinforcement. Nevertheless, a new major substation was planned at Seacoal Lane and work upon it has recently been commenced.

A substation planned before vesting day by the London Power Company, at Crosswall, near Fenchurch Street in the City, was brought into commission during 1948 to



supply the newly electrified railway line from Liverpool Street to Shenfield.

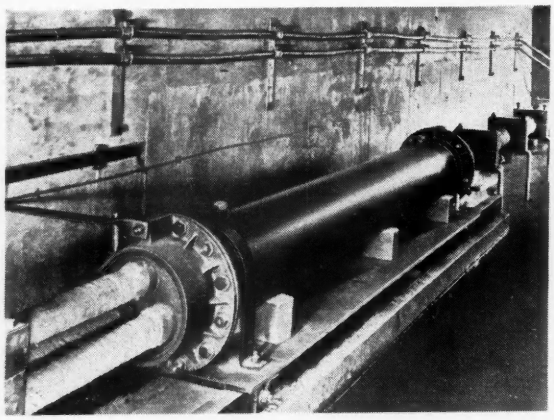
North-Eastern Sub-Area

A rapid development of the load in the North-Eastern part of the Board's Area was responsible for the carrying through of several reinforcement schemes of great urgency. The Central Authority constructed the new power station West Ham "B" and from there the Board ran two 0·5 sq in, 66 kV oil-filled three-core cables to a new substation at an existing supply point at Cathall Road, Leyton, in 1951.

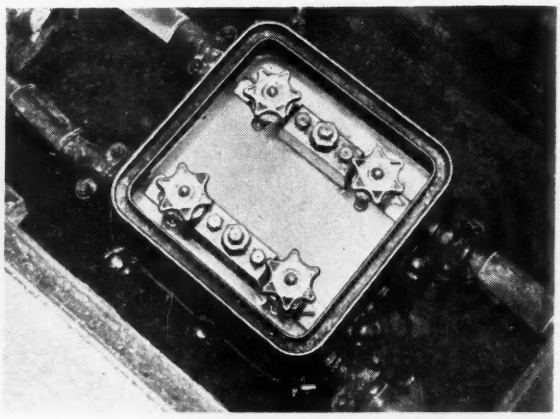
The Authority laid two B.I.C.C. 0·6 sq in, 132 kV cables from the Barking power station to a new L.E.B. substation at Perth Road, Ilford, and a short connection laid by the Board, of 33 kV cables to the adjacent power station at Ley Street, permitted the closing down of Ley Street as a generating station in 1952.

At Barking, discussion had been in progress before

PRIMARY DISTRIBUTION SYSTEM SERVING LONDON'S HIGH LOAD DENSITY ELECTRICITY REQUIREMENTS



Dividing out box on B.I.C.C. 132 kV three-core impregnated gas pressure cable, Barking generating station to Perth Road, Ilford, substation



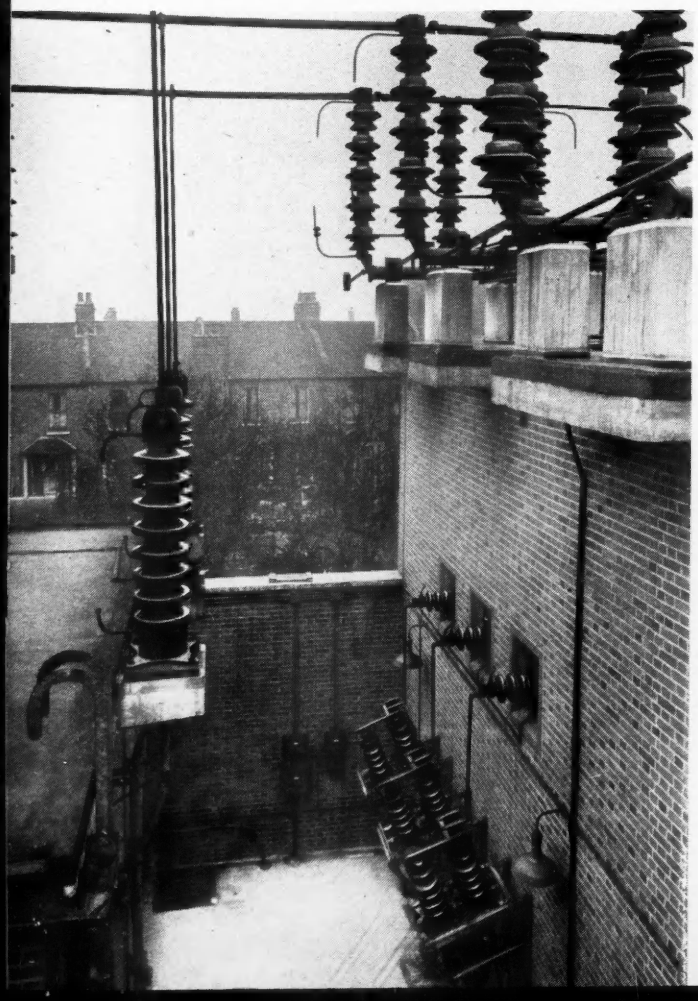
Gas surface box providing pneumatic access to B.I.C.C. impregnated pressure cables for testing and gas leak localization

vesting day between the Corporation and the County of London Company for a reinforcement of supplies by the tapping of two 33 kV cables supplying substations in the adjoining Borough of Ilford. These plans were brought to fruition by the Board and a new substation was erected at Mayesbrook Park, fed by short spurs from the Ilford cables, in 1952. With great difficulty a site was found in the Epping Forest District and a new substation built. This was supplied by three 0·2 sq in, 33 kV three-core cables from Perth Road, Ilford.

The opportunity was taken to lay, experimentally, one gas-pressure cable with an aluminium sheath, the other two being normal solid, screened type cables. This was one of the first of the major projects conceived from the beginning by the Board and was completed, and commissioned, in 1952. To reinforce supplies at Blackhorse Lane, Walthamstow, a 66 kV oil-filled three-core cable, of 0·15 sq in cross-section, was laid from Hackney power station in 1953.

The Willesden Corporation had, before vesting day, intended to construct a new substation at Kimberley Road, and the London Board proceeded with this work modified by the changed circumstances. Four 0·5 sq in, 22 kV three-core screened cables were laid from the power station at Acton Lane and the new substation was put into service during 1953. To afford much needed relief to the old generating plant in the former Borough Council's power station at St. Pancras a new substation was built at Georgiana Street to contain, ultimately, three 30 MVA 66/11 kV transformers. Two of these have been installed and were put into commission during 1953.

Termination of 132 kV gas pressure cable at Perth Road, Ilford



Southern Sub-Area

The building development in the Southern part of the Board's Area has been prodigious, and the amount of new work needed to keep pace with the growing demand has been correspondingly great. The power station at Blackwall Point, formerly owned and operated by the South Metropolitan Company, ceased to generate on 1st April, 1947, and was in the process of rebuilding at vesting day. The work proceeded smoothly and the station commenced operating again as a power station in 1951. The local supplies had been maintained by cables from the power station at Barking while a new substation was constructed to take a supply at 33 kV from the new power station.

In the Southern Sub-Area also is the Deptford East power station: the cradle of high-voltage transmission since it was from here, in 1890, that Dr. S. Z. de Ferranti's revolutionary conception of transmission to London by underground mains at 10 kV single-phase, achieved realization. In spite of the forebodings of knowledgeable experts these mains gave 42 years' continuous service before being superseded by three-phase transmission cables.

A substation at Deptford East, known as Stowage "A," built by the L.E.S.C. in 1925, had become overloaded and a new substation was built on a neighbouring site, and called Stowage "B." This is supplied by four 0·5 sq in cables at 22 kV from Deptford East power station and came into service during 1953. The 22 kV

cables between Deptford West and Ewer Street and Horseferry Road were cut and diverted in and out of the new power station built at Bankside on a site adjoining the old one, formerly operated by the City of London Company.

While this work was in progress the opportunity was taken to make some full-scale tests on live 22 kV cables of a cartridge-operated cable-spiking gun intended as a final check on cable identity when this was not confirmed beyond doubt by other methods. The ready co-operation of the British Post Office and the British Electricity Laboratories made it possible to treat the operation as a piece of research and some valuable information was obtained concerning fault and induced currents in addition to the practical proving of the cable-spiking implement.

Several other modifications of the 22 kV network, made possible by the central view of the transmission problems now taken, enabled the old power station at Penrose Street, Southwark, formerly an asset of the Borough Council, to cease operation as a generating station in 1953.

The demands in the Southern Sub-Area show little signs of decreasing in the rate of their growth and new major substations are in the construction stages at Kennington and at Southwark Bridge Road, and plans are being prepared for a new 66/11 kV substation at Sydenham. Deptford East was mentioned in our 1947 article as being notable for its non-standard 25 c/s three-phase supply. This supply is still given for the purposes of railway traction, but here we are more concerned with its standard 50 c/s supply which has been taken, at 66 kV, to a new substation at Bengeworth Road, Lambeth, on the site of a former generating station of the South London Electric Supply Corporation.

This was commissioned at the end of 1953 and will provide an urgently needed reinforcement to the distribution area of South London, west of Camberwell, including Lambeth and parts of Clapham and Norwood. For the past 15 years these have been included in a large area west of Camberwell served by the former County of London Company from Valley Road substation which received supply at 66 kV from Barking power station.

The Barking/Valley Road transmission consists of three circuits each comprising three 0·35 sq in single-core oil-filled 66 kV cables laid in trefoil, the firm capacity of this circuit for continuous loading being 99 MVA. Each feeder has a 50 MVA transformer at both ends and all switching is done at 33 kV. The actual maximum demand for the winter of 1951–52 was of the order of 110 MW and the need for relief was therefore a matter of extreme urgency.

It was accordingly decided that the reinforcement should take the basic form of three 66/33 kV feeder transformer units which would be tied into the existing 33 kV network fed from the Barking/Valley Road transmission. The arrangement finally adopted envisaged the use of three existing 0·15 sq in three-core solid 33 kV cables feeding Brixton substation from Valley Road substation for use as interconnectors between Valley Road and Bengeworth Road substations, the latter substation then feeding Brixton and also two new substations each of 60 MVA capacity at Kennington and Clapham.

Site of New Substation.—The existing London Electricity Board substation at Bengeworth Road, Lambeth, included some land on which formerly stood part of the original South London Corporation's generating station and it was decided to use this site for the new substation, the foundations being laid during the autumn of 1952.

E.H.V. Transmission.—Three 0·5 sq in three-core 66 kV rubber bitumen "sandwich" served impregnated pressure cables were laid from the Deptford East generating station, now under reconstruction, to Bengeworth Road, a route length of about five miles. The construction work on this rather mixed route involved on the one hand six headings totalling some 250ft, a vertical rise of 70ft at the generating station and the use of an anti-vibration alloy sheath for one cable section over a railway bridge. On the other hand, it was possible in some parts of the route to utilize section lengths of up to 425 yd. Each cable is separately fed with nitrogen gas at 200 lb/sq in at each end of the route, and double gas entry joints with surface boxes are installed at half-mile intervals to permit rapid leak location and re-gassing should this be required. All gas alarm indications are brought out to the 33 kV control panels at Bengeworth Road, and consist of a cable pressure alarm and two cylinder pressure alarms for each cable at each end of the route, the time interval between the latter serving as an indication of the rate of gas leak. In the remote event of the cable gas pressure dropping below the minimum operating pressure, the cable is automatically tripped out of circuit.

All 33 kV cables, of which some 40,000 yd have been installed, are of the three-core single-wire-armoured solid type and are connected as feeder transformer units of 15 MVA nominal capacity, two such circuits being required for Brixton and four each for Clapham and Kennington substations.

Transformers.—Three 50 MVA 66/33 kV type OFB feeder transformers have been installed, each being connected in delta/star formation. The 66 kV feeders after being trifurcated are connected directly to the oil-filled cable boxes, one per phase, on the transformers. Each cable box is physically segregated from the main tank of the transformer and has a separate feed from the conservator. Connection to the winding of the transformer is made by way of a bushing passing through an insulating barrier. This latter connection serves as a disconnecting link and is enclosed in an aluminium tube with corona shields at each end. A port is provided at the top of each cable box for inserting test bushings. A relief valve is provided to operate in the event of gas leakage from the cable bushing entering the cable chamber; in addition each cable box is provided with a diaphragm type explosion vent.

At Epping New Road substation there are three 15 MVA transformers supplied at 33 kV from Perth Road, Ilford. One of the cables supplying these transformers is a gas pressure cable with aluminium sheath

Each transformer is connected to two Serck coolers and each of these is designed to deal with 60 per cent of the total transformer losses. The operation of the first cooler is initiated by an auxiliary switch on the transformer 33 kV circuit breaker, but should the transformer be charged from the 66 kV side only with the 33 kV circuit breaker open, a " snap " switch on the control board can be used to start up the cooler. The second cooler is operated from a relay actuated by the top oil and winding thermometers.

For the purpose of sound insulation the 50 MVA transformers are in totally enclosed brickwork cells, and the coolers are situated in adjacent open compounds together with neutral earthing reactors. These reactors are of the outdoor, oil immersed type connected between the transformer neutral point and earth. Each has a reactance of 3·0 ohms and a current rating of 3,000 A for 30 sec.

Two 15 MVA 33/11 kV transformers are provided for supply to the local 11 kV distribution network. These transformers, each connected in delta/star, are installed in open compounds approximately in the centre of the site. The neutral points are connected solid to earth. Two spare compounds allow for future extension and one of these is being occupied temporarily by four 2 MVA 11/3·3 kV transformers supplying a non-standard network.

Switchgear.—The 20 unit 33 kV switchboard is a horizontal draw-out, double busbar type board, the circuit breakers being rated at 750 MVA and equipped with " Monobias " type bus zone protection. The switchroom is divided into three main fire sections and in addition the busbar section switches are each enclosed in a separate fire section. Shingle filled pits are provided beneath each switch unit for dealing with oil leakage or fire suppression, this being additional to the automatic CO_2 protection equipment.

The 11 kV switchgear comprises 21 units arranged in two sections. This switchboard can be extended when space becomes available in the area occupied by 3·3 kV switchgear. The 11 kV switchboard is also a double busbar horizontal draw-out type rated at 250 MVA.

Control and Supervisory Equipment.—The 33 and 11 kV switchgear is operated from one control board of the corridor pattern. Mounted on the front section are the mimic diagram, controls and indication; the rear section contains the 33 kV relays only, all 11 kV relays being mounted on swing panels situated on the actual switch units. The 33 kV mimic diagram is situated on the upper section of the panel and the 11 kV mimic diagram on the lower section; thus a very clear picture is presented to the operator of the state of the system at any time. The board is normally " dark " with the exception of three amber lights operated from potential transformers on the secondary sides of the 50 MVA 66/33 kV transformers which give indication that they are charged. The control switches are of the discrepancy type which, together with the ammeters, form part of the circuit diagram; alarm indications are given on facias which become illuminated when alarms are operated. Remote oil temperature thermometers are included on all transformer panels; these are of vapour pressure type and the maximum run of capillary tube is of the order of 174ft. The alarm system operates a 50 V telephone type relay system. The large facia in the lower central part of the control board is a diagram of zones covered by fire protection, and in case of fire the section involved becomes illuminated.

Future provision has been made in the control room for a coded miniature supervisory panel which will control a satellite substation at Brixton. This panel will include alarm facias for two normally unattended substations at Kennington and Clapham.

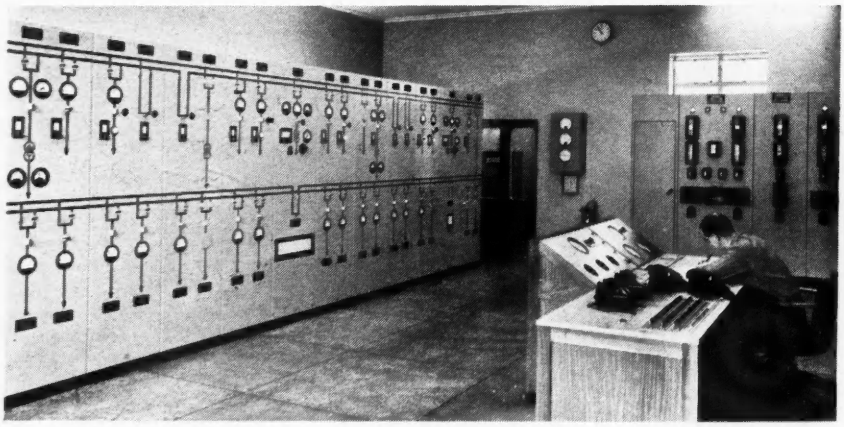
Batteries.—For switch closing and tripping two 110 V 100 Ah batteries have been installed. These are selected through changeover switches so that one battery is available for normal duty and the other for emergency lighting.

For intertripping between the primary and secondary sides of feeder transformers, a separate 30 V 10 Ah battery is provided in a sheet steel cubicle, together with its own two-rate manual charger. A further 50 V 20 Ah battery supplies the alarm and supervisory control system. All batteries, with the exception of the intertripping battery, are in the basement, above which is the battery control room in an annexe to the main control room.

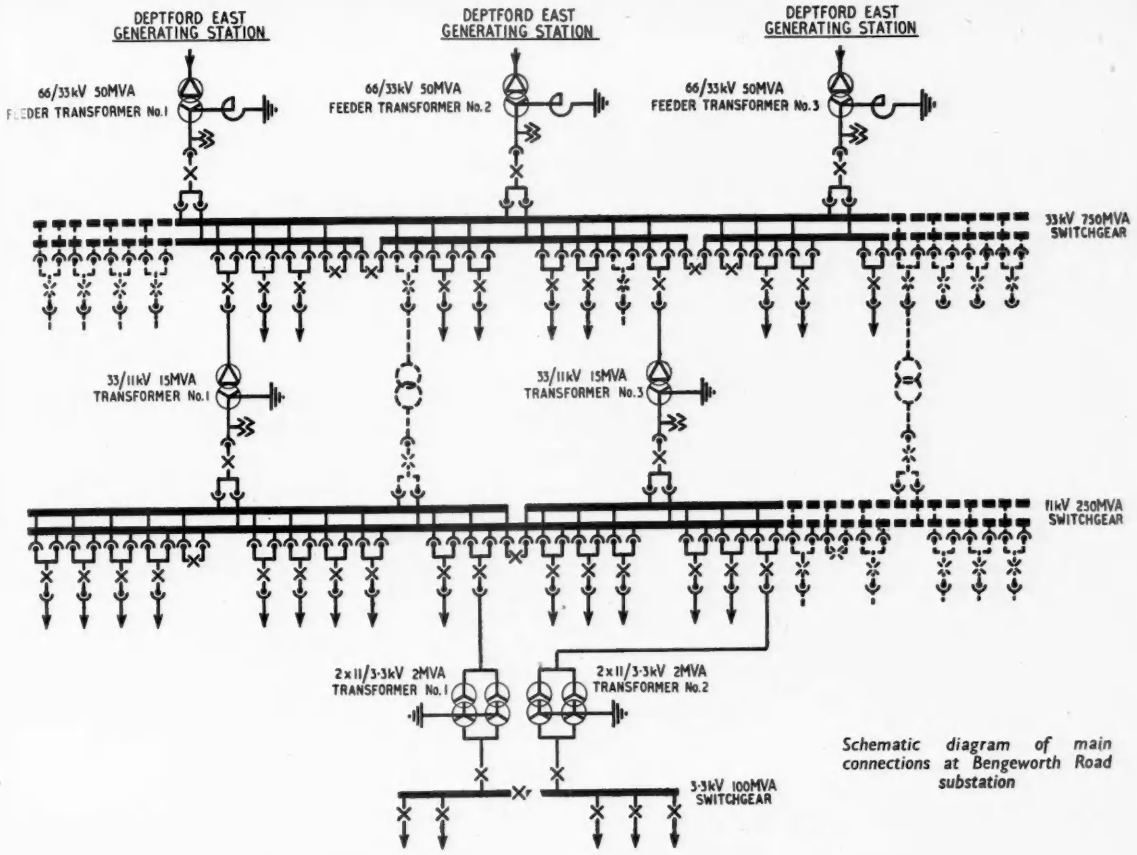
Metering equipment is situated in the control room annexe and provides for statistical metering to summate the load of the local 15 MVA 33/11 kV transformers. Mounted on the metering panel are printometers to record the load on each of the substations at Kennington, Brixton and Clapham, together with a fourth printometer for the incoming 66 kV supply from Deptford East generating station.

Fire Protection.—CO_2 type fire protection equipment has been installed to cover the 33 kV switchroom, 11 kV switchroom, and the three enclosed 50 MVA 66/33 kV transformer cells. There are two separate batteries each consisting of fifteen 80 lb cylinders, one battery for automatic discharge and one for manual stand-by control.

For automatic control a suitable number of fusible glass bulb type links are situated in each fire zone and are rated to operate at 155 deg F. A line of such links has been arranged to run through the pedestals of the



Bengeworth Road control room has a normally " dark " main switchboard. The 33 kV system is indicated at the top and the 11 kV system on the lower section


DEPTFORD EAST GENERATING STATION
66/33kV 50MVA FEEDER TRANSFORMER No.1
DEPTFORD EAST GENERATING STATION
66/33kV 50MVA FEEDER TRANSFORMER No.2
DEPTFORD EAST GENERATING STATION
66/33kV 50MVA FEEDER TRANSFORMER No.3
33kV 750MVA SWITCHGEAR
33/11kV 15MVA TRANSFORMER No.1
33/11kV 15MVA TRANSFORMER No.3
11kV 250MVA SWITCHGEAR
2x11/3·3kV 2MVA TRANSFORMER No.1
2x11/3·3kV 2MVA TRANSFORMER No.2
3·3kV 100MVA SWITCHGEAR

Schematic diagram of main connections at Bengeworth Road substation

33 kV switchgear units where a link is situated behind each circuit breaker tank and protected by a guard. The fusible link lines connect to the operating valves of the cylinder battery via phosphor-bronze cables enclosed in brass tubing. The stand-by manually controlled battery is operated by pull handles contained in a cabinet in the control room.

In case of fire an alarm is initiated by a gas pressure switch in the supply pipe to the zone affected, upon the opening of the local valve. In addition, the operation of the link line initiates an alarm by closing an auxiliary switch placed in the link line circuit. Audible alarm is given in the control room, and at the same time the facia diagram situated on the 33 kV control panel, referred to previously, becomes illuminated. Red lamps adjacent to entrances to fire zones become illuminated when the CO_2 system is mechanically locked off during progress of work in any section.

Lighting and Power Services.—Auxiliary supplies for the substation are derived from the local l.v. network, supported by a transformer chamber equipped with 500 kVA transformers. Alternative supplies are provided with an automatic changeover switch to which essential services are normally connected.

The control room and offices are illuminated with "warm white" fluorescent lighting. Recessed louvred fittings in the control room ceiling have been designed for maximum illumination on control panel surfaces and for prevention of glare to the operators at the control desk. Transformer cells and switchrooms are provided with incandescent lighting generally on corridor switching. Standard fittings of the parabolic or elliptical angle type are employed and give a high standard of illumination on the working surfaces of the plant installed.

Before nationalization this substation would have been supplied from Barking power station; joint planning, made possible by the 1947 Electricity Act, enabled a supply to be taken from the much nearer Deptford East power station with a consequent saving of eight miles of cable.

The planning and execution of the work were carried out by the Design and Construction Branches, and operation of the substation will be the responsibility of the Operations Branch, of the Chief Engineer's Department. The principal contractors engaged on the works were as follows:—British Insulated Callender's Cables, Ltd., 66 kV cables; W. T. Henley's Telegraph Works Co., Ltd., and Enfield Cables, Ltd., 33 kV cables; A. Reyrolle & Co., Ltd., 33 kV and 11 kV switchgear; Switchgear & Cowans, Ltd., 3·3 kV switchgear; English Electric Co., Ltd., 66/33 kV transformers; British Thomson-Houston Co., Ltd., 33/11 kV transformers; Sir Lindsay Parkinson & Co., Ltd., building.

South-Eastern Sub-Area

To deal with the rapidly growing load in this relatively sparsely populated part of the Area, three 33 kV 0·2 sq in cables were run from the grid substation at Eltham to a new substation at Sidcup in 1952. Several projects which had been planned before vesting day for augmenting the capacity of the 22 kV network formerly operated by the Woolwich Borough Council, were carried through to completion. New substations were built at Fuchsia

Street and Restons Crescent, and existing 0·25 sq in 22 kV cables from Barking power station to Dartford were looped in and out of the substation at Walnut Tree Road, Erith. A new major substation is planned in Woolwich, at Eglington Road.

South-Western Sub-Area

This Sub-Area ceased to exist as an engineering unit on 1st April, 1953, in accordance with the Board's decision to reorganize on a " two-tier " basis, and it was divided into two Districts, each under a manager. For the purposes of this article, however, it is convenient to consider the area as it existed for the first five years.

No large scale cable work has been necessary, but some important alterations at Lombard Road power station (formerly Battersea Borough Council), and at Durnsford Road and Dukes Avenue (formerly Wimbledon Corporation) have achieved a much better use of assets.

At Barnes power station, the London Division made available a supply at 66 kV from Wandsworth power station, by laying two 0·4 sq in gas-pressure cables which were brought into commission in 1950. To supply a rapidly developing part of the area a new substation to contain two 15 MVA 66/11 kV transformers is in course of construction at Roehampton.

Western Sub-Area

A very large part of the Western Sub-Area is made up of territory formerly supplied by Central London Electricity and in this fully developed area which had enjoyed the benefits of centralized planning for a longer time and to a greater extent than many of the others, it might be expected that relatively little new work would have been required. On the contrary, there has been very great activity in order to meet the ever-growing demand as business has revived since the war ended.

Former C.L.E. intentions for new major substations at Old Brompton Road and Mason's Yard, with extensive reconstructions and additions at Eccleston Place, Alpha Place, Horseferry Road and St. Martin's Lane were implemented and the following cables were laid:—From Battersea power station to Alpha Place: a 66 kV 0·4 sq in three-core gas-pressure cable. From Battersea power station to Old Brompton Road: a similar cable to join 0·6 sq in single-core solid cables. From Old Brompton Road to Alpha Place: three 22 kV 0·5 sq in solid screened-type three-core cables.

The supplies to the Paddington District, formerly the province of the Metropolitan Company, were integrated into the 22 kV system by the laying of two 22 kV 0·5 sq in three-core screened cables between Amberley Road substation, which was reconstructed, and Alpha Place, and two similar cables to Old Brompton Road. Also in the Paddington District a new substation has been built at Moscow Road and four 0·5 sq in 22 kV three-core screened cables have been brought to it from Porchester Terrace.

Extensive reconstruction of the substation at Short's Gardens is about to be undertaken, and entirely new substations are about to be built at Whitfield Street, in the Tottenham Court Road district, and Back Hill, Holborn.

From what has been enumerated it will be evident that the problems of London load handling are being attacked with vigour and foresight. A tremendous amount of highly skilled planning and construction has been a feature of the past five years. In addition to what has received notice, several major supplies at 22 kV have been given to large private consumers in the Eastern industrial districts.

We are indebted to Mr. H. J. Randall, C.B.E., F.C.I.S., Comp.I.E.E., chairman, London Electricity Board, to Mr. D. B. Irving, B.Sc., M.I.E.E., deputy chairman and former chief engineer of the Board, and to Mr. L. H. Welch, B.Sc., M.I.E.E., the present chief engineer, for their co-operation in the preparation of this article and permission to publish it.

Machinery Makers' Dinner

MR. F. H. SCHROEDER, chairman, presided at the annual dinner of the Associated Dynamo and Motor Manufacturers held at the Trocadero Restaurant, London, W.1, on 16th February. The principal guest was Lord Sempill, A.F.C., who proposed the toast of the organization. In the course of his speech Lord Sempill said that this country had always produced, and would continue to produce, a goodly proportion of the inventive genius of the world. He praised the electrical industry for its adoption of every means of improving production and said that this expanding industry should be able to absorb surplus workers from non-expanding industries. He urged British workers to take as enlightened a view of labour-saving devices as the Americans did.

The response was by Mr. J. S. Ramsden, who was chairman from 1934 to 1946. He said that the organization was now 24 years old and he paid a tribute to the men who had built it up. Conditions before its establishment were very bad; cut-throat competition was causing losses to all the firms concerned. There was much ill-informed criticism of " rings," but trade combinations served a useful purpose and very few of them (and certainly not the A.D.M.M.) abused their powers.

The health of the guests was proposed by Mr. Schroeder, who pointed to the difficulties with which manufacturers now had to contend. There had been a change from a sellers' to a buyers' market accompanied by import restrictions, non-availability of currency for would-be customers, export restrictions on " strategic " goods, etc. The members could justly be proud of their export achievements and they would overcome all difficulties by their enterprise, ingenuity and hard work. They asked, however, for the Government's assistance in the form of reduced company taxation and more realistic depreciation allowances. He regretted that they had been involved in a vast amount of unproductive work by the Monopoly Commission's inquiry.

Mr. Schroeder then, after referring by name to the leading guests, concluded by mentioning the immense possibilities before the industry. There was a vast unfulfilled demand which it was in a peculiarly favourable position to satisfy.

Lt. Gen. Sir Thomas Hutton, director of the British Productivity Council, replying for the guests, said that although we had all the means of efficient production we were not quick enough off the mark. Associations provided a means of pooling information and that was the aim of the British Productivity Council. The Council was trying to put industrial relations on a broader basis by forming local productivity committees for which he sought greater support.

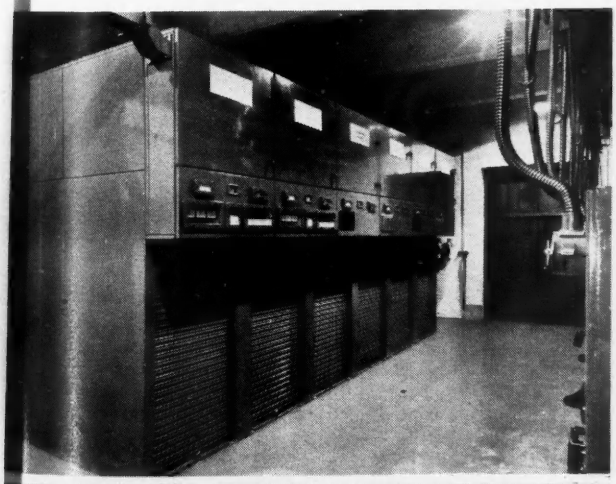
Nunhead substation showing British Electric Transformer Co.'s 45 MVA 66/33 kV transformer equipment with substation building adapted for the use of rectifiers, and G.E.C. transformers in the background

New Substations and Cable System for the Southern Region

Suburban Railway Frequency Change

ELECTRIC traction on the suburban lines of what is now the Southern Region of British Railways was introduced in stages from 1915 to 1930. The third rail d.c. system at 600 V, since raised to 660 V, was standardized for the Southern Railway after the 1923 grouping, divided into three sections for operating purposes. The suburban electrification had as its outer terminals, Gravesend, Orpington, Bromley North, Hayes, Addiscombe, Caterham, Tattenham Corner, Epsom Downs, Dorking, Chessington South, Guildford (via Effingham Junction), Hampton Court, Shepperton and Windsor.

Interior view of Queens Road substation showing the G.E.C. 33 kV switchgear, and (below) B.T.H. 33 kV switchgear in Lewisham switching station

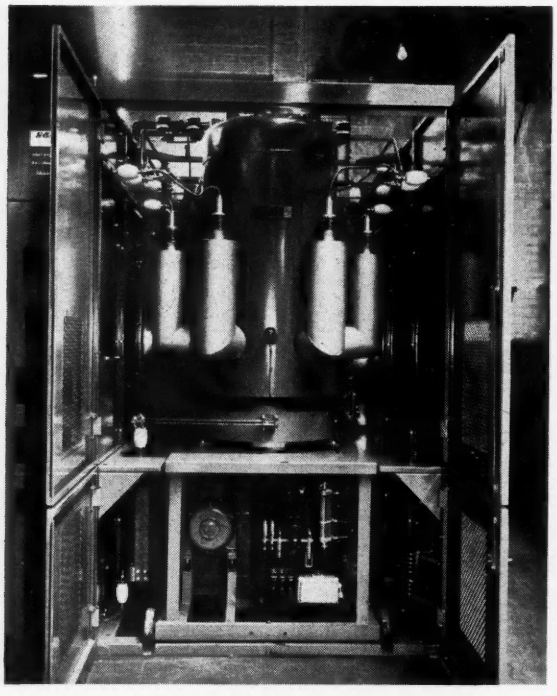


The d.c. supply was obtained from 49 manually operated rotary convertor substations fed at 11 kV three-phase 25 c/s. The power for the Western Section was generated at the railway's own Durnsford Road generating station, while on the Central and Eastern Sections power was received from the London Electric Supply Corporation's Deptford power station, which was originally constructed to supply the railway only.

These substations and power stations are now at the end of their economic life, the Deptford power station having meanwhile been extended and reconstructed for 50 c/s. In addition, the load has increased due to the number of electric trains added by reason of the outer area electrifications which have always been supplied at 50 c/s independently. A further increase in load is due later this year by the substitution of ten-car trains for the present eight-car trains on certain routes on the Eastern Section. Provision is also required to meet increased power demands for extension of services, and it was, therefore, decided to replace the whole of the 25 c/s power distribution system with a new 50 c/s system employing remotely controlled rectifier substations at a cost of about £11·5 million, of which £1·75 million is allocated to civil engineering works.

The scheme provides for 71 substations, together with 70 track paralleling hut equipments, seven switching stations for 33 kV circuits and three additional points of connection to the existing 33 kV 50 c/s fed substations. These are situated as shown in the accompanying map of the area, and all of them will be operated by supervisory remote control from one of three new control rooms. The substations are arranged so that the track voltage can be increased from 660 V to 750 V at some future date. The implementing of the scheme will result in better average track voltage with consequent improved lighting of electric trains, reduced line losses and increased protection against track short circuits. Provision is also made for future augmentation of the train services.

Power for the new 50 c/s system is entirely obtained from the B.E.A. Four supply points emanate from Deptford generating station at 66 kV over 0·25 sq in three-core oil-filled feeder cables, the terminations of which are in three single-core 0·25 sq in fluted-lead oil-filled cables. The portions of these feeders which are on British Transport Commission's property are under its ownership, while the other portions through public thoroughfares or on B.E.A. property are owned by the latter. This applies also to the



Internal view of G.E.C. rectifier cubicle

feeders from Wimbledon mentioned later. These 66 kV feeders connect Deptford generating station separately to 45 MVA transformers situated adjacent to railway substations at Nunhead, South Bermondsey, Lewisham and Brockley.

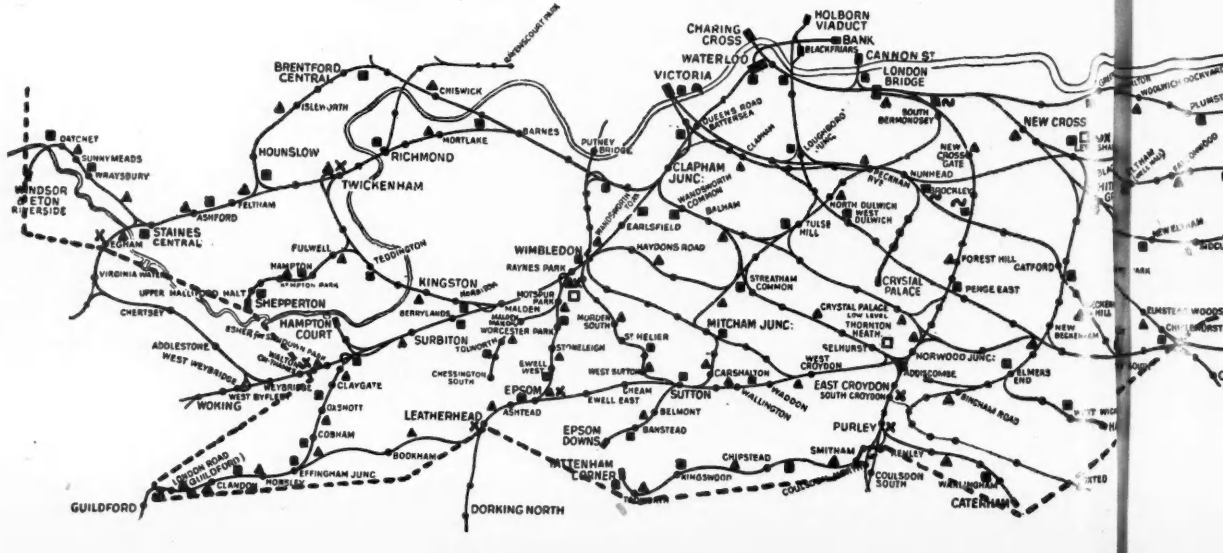
Other supply points from the British Electricity Authority are at 33 kV and are taken over the Commission's 0·25 sq in three-core oil-filled cables from the B.E.A.'s grid substations at Northfleet (two feeders), Wimbledon (five feeders) and Leatherhead (two feeders) and from Croydon "B" generating station (two feeders, one of which was installed in advance of the change of frequency scheme). From these supply points the feeders are taken to a railway substation which distributes to other substations. In addition, connection is made at Walton, Guildford, Egham, Leatherhead, Purley, South Croydon and Chislehurst with the 33 kV system already installed by the Southern Railway for its outer area electrification scheme.

The 66 kV and 33 kV feeder cables are accompanied throughout by a multi-core star-quad pilot cable which carries the circuits for the "Solkor" feeder protection and supervisory remote control as well as the low oil pressure indication for the oil-filled feeder cable, telephones, electric clocks and metering. The h.v. cables are of the paper insulated oil-filled lead alloy sheathed and served type with an impervious layer in the serving, and are not armoured. The pilot cables are armoured, and the number of cores in the pilot varies between 12 and 76.

In general the feeder cable, with its pilot, is laid in surface reinforced concrete troughing without sand or other filling, and is covered with a reinforced concrete lid. Where there are two feeders, one pilot cable usually suffices, and the concrete troughing is divided to give two compartments, the smaller one of which takes one feeder and the larger takes the other as well as the common pilot. The oil-filled cables are continuously supported and hence where the cables are carried over bridges, along parapet walls, or under viaducts they are placed in asbestos cement tubes which are supported by steel hangers.

Where the ground is suitable, the cables are laid direct in the ground at a depth of 1ft 6in or thereabouts and protected with a reinforced concrete slab laid on the surface above each cable. The cables were made by Pirelli-General Cable Works, Ltd., which also has a contract for installing the route materials and laying the cables. The concrete troughing, lids and slabs were made by the Southern Region's Civil Engineer's Concrete Works at Exmouth Junction, Exeter. The total length of feeder cable in the entire scheme is about 300 miles. Cable laying started in August, 1952, and about 100 miles of cables have already been laid and jointed.

The 66 kV supply from Deptford generating station is taken directly to outdoor 66/33 kV 45 MVA transformers at Nunhead, South Bermondsey, Lewisham and Brockley. The first two were supplied by the British Electric Transformer Co., Ltd., and the latter two by the Hackbridge & Hewittic Electric Co., Ltd. All were made to the same specification and each equipment is arranged with the three-phase 45 MVA transformer star connected on the 66 kV side with on-load tap changing equipment in eleven 1·5 per cent steps to give normal or up to 4·5 per cent increase or down to 10·5 per cent decrease in ratio. On the 33 kV side, the transformer is delta connected and with a separate star-connected earthing transformer, the secondary of which provides 130 kVA for oil pumps and auxiliary circuits. The neutral point of the earthing transformer is earthed through a convector type liquid neutral earthing resistance supplied by the B.T.H. Co., and is so

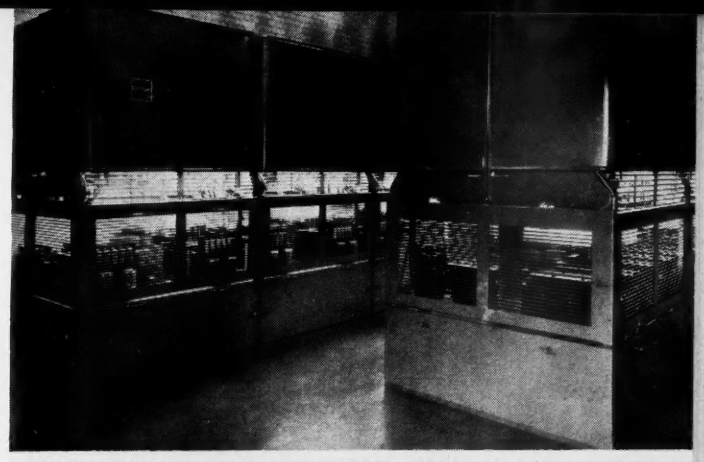


arranged as to pass 788 A for 30 sec with a current transformer connected between the transformer neutral and the resistor. Both the main and earthing transformers are equipped with Buchholz protection, the main transformer being cooled by external coolers through which the oil is pumped.

The 66 kV feeder is terminated in single-core sealing ends on the outdoor structure from which bare copper connections are taken direct to the transformer bushings. The 33 kV connections are similarly arranged, there being two three-phase circuits in parallel of 0·4 sq in single-core screened solid type cables from sealing ends on the structure and connecting to the switchgear in the substation. The 66 kV cables, the transformer and the 33 kV cables, are protected by "Solkor" overall protection arranged to trip both the 66 kV oil circuit breaker at Deptford generating station and the 33 kV oil circuit breaker at the substation. At Nunhead, South Bermondsey and Brockley, the 33 kV switch is, with those on outgoing feeders and transformer connections, placed in the adjacent substation, but at Lewisham it has been necessary to build an independent switchhouse as space in the substation is not yet available.

The substation equipments are all to the same specification and contain between one and five pumpless air-cooled mercury arc rectifier equipments, each rated at 2,500 kW continuously on the d.c. side at 750 V. The rectifier transformers are all of the "ON" outdoor type and are delta connected on the primary (33 kV) side with an externally operated tapping switch to give normal or $\pm 2{\cdot}5$ per cent or 5 per cent voltage correction and in addition internal links to allow the output of the rectifier to be 660 V or 750 V. When operating at 660 V the full load d.c. output is 2,200 kW. The transformer secondaries are arranged in twelve-phase zig-zag connections. A tertiary winding is provided for supplying the rectifier cooling fans and auxiliary circuits. Full load output current of the rectifier set is 3,333 A d.c. at either 660 V or 750 V, according to the tapping connected on the transformer primary.

The h.v. switchgear is of the indoor metalclad single busbar type with withdrawable oil circuit breakers having a rupturing capacity of 750 MVA. A withdrawable 10 kVA auxiliary transformer with an output of 415/230 V three-phase four-wire is provided on certain feeder units arranged to plug into the feeder side of the unit. The oil-filled three-core feeder cables are brought to stop joints outside the substations and the feeders continue as three-core screened solid type cables to terminal boxes on the back of the switchgear. The connections between the high voltage switchgear and the main transformer



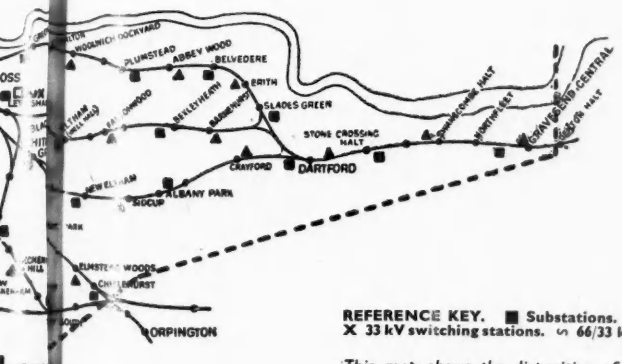
Top: Queens Road substation showing Hackbridge & Hewittic glass bulb rectifier equipment in service, and (below) Bertram Thomas d.c. switchgear in Queens Road substation

also take the form of three-core screened solid type cable.

The d.c. switchgear consists of truck mounted high-speed circuit breakers with a continuous rating of 3,000 A for the feeders and of 5,000 A for the rectifiers. The trucks for the high-speed circuit breakers are 2ft wide. The feeder circuit breakers are arranged to trip on forward current while the rectifier circuit breakers are arranged to trip on reverse current. The rectifiers are protected against overloads by inverse definite minimum time overcurrent relays and by instantaneous overcurrent relays all mounted on the h.v. switchgear. Instantaneous earth leakage relays are also provided and are likewise mounted on the h.v. switchgear to protect the rectifier transformer.

The substation contracts have been allocated in three groups, Western, Central and Eastern. On the Western Section, the contractor for the h.v. switchgear is the G.E.C., which is providing its KSB.7 switch units. The contractor for the rectifiers and transformers is the Hackbridge & Hewittic Electric Co., Ltd., which is providing rectifiers of the glass bulb three-anode type, a rectifier set consisting of seven cubicles, each containing four glass bulbs, i.e., 28 bulbs per set. The four glass bulbs of each cubicle are connected as a twelve-phase set.

The contractor for the d.c. switchgear is Bertram Thomas (Engineers), Ltd., which also has the contract for the d.c.



REFERENCE KEY. ■ Substations. ▲ Track paralleling huts. □ Control stations. X 33 kV switching stations. ∽ 66/33 kV 45 MVA transformer. --- Boundary of scheme

This map shows the disposition of the 71 substations, 70 track paralleling hut equipments, seven switching stations for 33 kV circuits and three additional points of connection to the existing 33 kV 50 c/s fed substations

switchgear in the track paralleling huts on this section. The feeder high-speed circuit breakers are calibrated for a range of overcurrent settings from 5,000 A to 10,000 A. The circuit breakers are latched in and are not provided with a hold-on coil. They are provided with a relay to reduce the trip value in sympathy with a drop in voltage, to the extent that if the track voltage falls to 40 per cent, the circuit breaker will trip on zero current. This feature is of value in making the circuit breaker more sensitive to track faults.

A 110 V switch closing and tripping battery with combined metal rectifier trickle and quick charging equipment, and a 50 V battery with similar charging arrangements for operation of the supervisory control were supplied by Chloride Batteries, Ltd.

On the Central Section, the contractor for the h.v. switchgear is the G.E.C. with the same type of switchgear as on the Western Section. This company is also supplying the transformers and rectifiers. The rectifiers are of the six-anode pumpless, air-cooled steel-cylinder type, four cylinders forming a 2,500 kW set arranged in two twin cubicle assemblies, each twin cubicle forming a twelve-phase assembly. The d.c. switchgear in both substations and track paralleling huts is of B.T.H. manufacture and consists of truck-mounted high-speed circuit breakers of the RJR type. In this case a pair of high-speed circuit breakers in parallel are arranged to form the rectifier circuit breaker and, although mechanically independent, are arranged electrically to operate as one unit. The circuit breakers have hold-on coils energized from the track supply so that a falling voltage trip characteristic is obtained inherently at a value dependent on the overcurrent setting of the breaker. The feeder high-speed circuit breakers are calibrated for a range of overcurrent settings from 5,000 A to 10,000 A. The battery equipments were supplied by Chloride Batteries, Ltd.

On the Eastern Section, the h.v. switchgear was supplied by the B.T.H. Co., and is of its Class MF.36 metal-clad type. The transformer and rectifier equipments were made by the English Electric Co., Ltd., and are of the six-anode air-cooled, sealed, steel-tank type arranged in pairs on each side of a central gangway, each pair being a twelve-phase assembly. The d.c. switchgear in substations and track paralleling huts was supplied by B.T.H., while the battery equipments were supplied by Pritchett & Gold and E.P.S. Co., Ltd., being similar to those for the other two sections.

Supervisory Control

The supervisory remote control is being supplied by the G.E.C. and has been specially adapted to give very rapid operation and indication, rendered necessary by the very large number of rectifier and feeder equipments controlled from each control station. There will be three control stations placed at Raynes Park, Selhurst and Lewisham, and these areas of control have been made to agree very closely with the railway operating areas on the Western, Central and Eastern Sections so far as these come within the boundaries of the scheme. Twenty-eight substations will be controlled from Raynes Park, 17 from Selhurst and 26 from Lewisham, in addition to which 33 kV switching stations, supply points and track paralleling huts will come in the area of each. Certain substations have their equipment divided between two control stations so that a method of alternative control from either of two control stations is employed for certain important substations in the inner area.

Of the 71 substations, 45 are in new standardized buildings; two are in viaduct arches and 24 are in buildings which were previously occupied by the 25 c/s rotary convertors. These are to be adapted for accommodation of the rectifier equipment. A further three of these buildings are being used as 33 kV switching stations and will also contain track paralleling d.c. circuit breakers. Of the original 49 rotary convertor substations, four were replaced by 50 c/s rectifier equipment before or during the war, the equipment of one substation being used to provide an extra substation on the inner area and the rest being distributed amongst other substations. Forty-six substations therefore remained in service at the commencement of the present scheme so that 19 substation buildings have been released for other purposes.

Substation Design

The standard substation buildings are to a common basic design, but slight variations are made to adapt this design to the requirements of the equipment for the three areas. Each consists mainly of a rectifier room and a switchgear room, a partition wall separating the two, and with swing door access between them. A battery room and a lavatory are built into the switchgear room, but with external access only. The buildings have 15½in cavity outer walls, the external width being 28ft 11in.

The basic design is "elastic" in length to allow of the rectifier room taking one or two equipments, and of the switchgear room taking the number of h.v. or d.c. switch units required at each site. Where more than two 2,500 kW rectifier equipments are required at a substation, two separate buildings are provided, being arranged left and right handed to allow up to four 2,500 kW rectifier equipments. A special feature in the design of these buildings is the complete elimination of trenches and the use of a suspended troughing system for small wiring interconnections, etc.

The adaptation of existing substation buildings requires a special layout to suit the ground level, space for transformers, position of tracks relatively to the building and the amount of switchgear to be installed. The conversion scheme is complicated in certain cases by the necessity of keeping some of the rotary convertors in service in the substation until an equivalent plant capacity of new rectifiers can be commissioned in it. It is sometimes necessary, for instance, either to keep the old d.c. switchgear in service until the new is commissioned or to provide switchgear in a temporary hut. Track paralleling huts are to a standard design, except for three buildings to accommodate shelf mounted circuit breakers released from elsewhere. Only the length varies.

The complete scheme is being designed and carried out to the requirements of the Chief Officer (Electrical Engineering), British Transport Commission. The installation of the cable, substation, and supervisory control equipment is being executed under the supervision of the Electrical Engineering (New Works and Development) Section, British Transport Commission, in close consultation with the Mechanical and Electrical Engineer, Southern Region, who has also been responsible for the production of the low-voltage feeders and track switching equipment.

The following are contractors for various civil engineering aspects of the scheme. Erection of substations and track paralleling huts: Tersons, Ltd., Demolition & Construction Co., Ltd., J. W. Ellingham, Ltd., L. & W. Whitehead, Ltd., and James Longley & Co., Ltd. Erection of control stations: Trollope & Colls, Ltd., and W. H. Gaze & Sons, Ltd. Excavations: G. E. Wallis & Sons, Ltd., J. B. Edwards & Co. (Whyteleafe), Ltd., Aubrey Watson, Ltd. Provision of pre-cast concrete and artificial stone units for substations and track paralleling huts: Girlings Ferro Concrete Co., Cooper Wettern & Co., Ltd. Piling for foundations: Piling & Construction Co.

Engineering in Europe

Abstracts from Foreign Technical Journals

INDUCTION heating installations work with an inductor as consuming device which transfers the power absorbed by it as heat to the charge by means of an alternating magnetic field. Since this is a high frequency field (500–20,000 c/s) closed through air outside the charge, the inductor reactance is very high compared with its resistance. The internal reactance of h.f. alternators is also considerable. These conditions would imply a very low p.f. which must be improved by capacitances.

In principle, series or shunt capacitors are possible, but an investigation shows that only the former is really satisfactory, since it enables the alternators to operate at a comparatively low terminal voltage and thus improves their safety of operation, simultaneously reducing dangers of short-circuits in the installation. It also becomes possible to obtain by an appropriate design of the series capacitors certain desirable current-reactance relations in the inductor circuit, e.g., to keep the power constant against reactance variations.

Spark-free commutation is obtainable by simple artificial circuits, viz. by insertion of a rejector circuit before circuit breaking. The matching of generator and heating circuit can be improved by shunted trimming capacitors. All these theoretical advantages were confirmed by tests in service conditions.—"Compensation of Induction Heating Plant with H.F. Alternators," K. Schonbacher, *E.T.Z.(A)*, Vol. 74, pp. 529–532, 1953, in German.

Jeumont Testing Station

The power on short circuit of the testing generator of the Jeumont Testing Station is 2,500 MVA at 18 kV, corresponding to 1,900 MVA when the impedance of the busbars is considered, or to a symmetrical current of 61 kA_{eff}, i.e., a power paralleled nowhere in Europe at the time of writing, and considerably in excess of the short-circuit powers occurring in any Continental power system. The rating of the testing transformer is 245 MVA at 1,270 V or 111 MVA at 300 V (on short circuit). The measuring equipment of the station is also quite up-to-date.

The author describes and illustrates tests on a 63/70 kV oil circuit breaker and series-testing of new medium-voltage breakers for 266 MVA breaking capacity during development work, oil-poor breakers for 250kV/5,000 MVA, and medium-voltage breakers for 500–1,000 MVA. Special short-circuit tests on isolating switches, current transformers, on-load tap changers and special breaker types are also described. Mention is made of post-arc current investigations and investigation of low-current circuit breaking carried out in the station.—"Contribution of the Jeumont-Charleroi Heavy-Power Testing Station to the Development of Equipment for large Power Systems," J. Jalabert, *Revue Jeumont*, Vol. 46, No. 23, pp. 101–112, 1953, in French.

Earth Electrode Resistance

Among the methods of reducing the resistance of earth electrodes so far tried that of the author deserves attention for the rather unusual and promising type of agent used. Since electrolytic processes play an important part in the mechanism of earthing, the idea of using an electrolyte for improving the earthing characteristics suggested itself, but it was difficult to find an electrolyte which would not corrode the electrodes.

The author succeeded in discovering such an electrolyte in copper-ferrocyanide which, in the form of a gel, not only absorbs water and binds it for considerable periods, but has also a great affinity to strong electrolytes often found in soils, so that the conductivity of the copper-cyanide gel may be improved in this way. Comprehensive tests, reported in the article, yielded the following main results. The gel-treatment of earth electrodes of an initial earth resistance of about 30 ohms does not result in an appreciable improvement, but if the original earth resistance is between 100 and 200 ohms, it may be reduced by up to 58 per cent; earth resistances of the order of 1,000 ohms may be reduced by up to 72 per cent. Also, a certain stabilization of the earth resistance is achieved.—"Effect of Treatment with Electrolyte-Gel on the Resistance of an Earth," I. H. Sanick, *A.S.E. Bull.*, Vol. 44, No. 25, pp. 1052–7, 12th December, 1953, in German.

Power Cable Joints

The main differences between the quality of the insulation of cable joints and that of the cable itself are the inhomogeneity and degree of absorption of impurities of the former, as well as the existence of cavities and higher loss factor in the insulation of the joints. The cavities in the insulation of the joints disappear if the joint is kept in an oil bath, but this has the disadvantage that the oil penetrates into the insulation of the cable itself with deteriorating effects.

Comprehensive investigations and experiments by the author have proved the possibility of producing cable joints not much thicker than the cable itself, and of the same dielectric strength as the cable. The method used eliminates the oil ducts in the cable joints and includes a temporary immersion of the insulation of the joint in an oil bath at 110 deg C. By this method the thickness of the joint insulation need not exceed that of the cable by more than 10 per cent for achieving the same breakdown strength. In the case of oil-pressure and external gas-pressure cables the thickness of the joint insulation can hardly be reduced, because these joints are very sensitive to air and moisture absorption. Joints of internal gas-pressure cables may be as thin as the joints of "dry-type" insulation cables.—"Production Methods and Weight Reduction of Joints of Power Cables," N. Klein, *R.G.E.*, Vol. 62, No. 10, pp. 467–477, 1953, in French.

Transmission Line Protection

The article deals with the conditions in future 400 kV systems, in which two-pole short-circuits will be comparatively rare, and symmetrical three-pole short-circuits practically absent. For preventing incorrect responses of the protection to overloads and voltage oscillations, the protection will therefore mainly use the negative and zero-sequence components.

The particular problems considered are:—(1) Automatic shunting of the compensating capacitors when current

surges occur, and their de-shunting after the clearance of short-circuits; (2) Correct operation of the relay protection, when capacitors are inserted into 1, 2 or 3 phases (inside or outside the protected zones); (3) Rapid clearing of short-circuits by two types of basic protection, each of which reliably backs up the other (not upsetting the dynamic stability of the transmission system); (4) Taking into account the characteristics of the long-distance transmission (capacitive susceptance, the reactors of the transverse compensation, corona phenomena, etc.); (5) Consideration of transient processes in lines and capacitors (at incipient short-circuits, and also during rapid reclosing and normal switching processes).

In lines with longitudinal capacitive compensation current components of a lower frequency (that of the natural oscillation of the system) must be reckoned with, and even during symmetrical three-phase short-circuits negative-sequence currents of this lower frequency will occur. The author analyses the problems as affected by position of the capacitor banks and degree of compensation, and presents theoretical aids for the correct choice of the protected zones.—" Problems of the Relay Protection of a Transmission Line with Longitudinal Capacitive Compensation," G. I. Atabekov, *Elektrichestvo*, No. 8, pp. 3–11, 1953, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electrical Equipment Sales

I HAVE read Mr. L. C. Roberts' letter on this subject in the *Electrical Review* of 12th February with considerable interest but cannot agree with his suggested remedy. Would it not be better to pass a law making it a crime for anyone to carry out electrical work to be connected to the public supply mains unless they are duly registered electricians or otherwise approved as being capable and efficient in electrical installation work?

I have been flogging this subject for twenty-six years, both in and out of the Press, and yet there are still hordes of dabblers and amateurs regularly carrying out extensions to installations and laying death traps and fire risks up and down the country.

Compulsory registration of both firms and operatives and severe punishment for " intruders " would very soon reduce electrical accidents in the home.

Bradford. HARRY MOSS.

Heat Pumps for " Tubes "

REFERENCE was made by Mr. G. W. Leader in your issue of 5th February to the possibility of employing the heat in London Tube railways as a source for heat pumps and its application to building heating. Mr. Leader is by no means original in this suggestion, for I made a direct proposal to the late Mr. S. C. Mount, heating and ventilation engineer, London Passenger Transport Board, in 1943, who told me that even then the temperature of the tubes was becoming a serious problem in some tube zones.

Consideration of (1) the heat of traction, (2) lighting and power applications, and (3) the metabolic contribution by passengers showed the enormous amount of heat dissipated in London tubes, its disposal, and the gradually increasing temperature of the thermal storage medium represented by the London clay surrounding them. Consequently, I was afforded the privilege of taking certain temperatures in a number of tube stations to satisfy my personal interests, and Mr. Mount also showed me a number of temperature records and isotherms made in certain sections of the surrounding clay.

I also contributed to the discussion on the paper " A Factory in a Railway Tunnel " by Mr. Mount on 9th January, 1946, on the same theme, as I considered that the heat pump could have been used as a means not only of removing unwanted lighting, power and metabolic heat, but usefully employing it, instead of merely discharging it to the atmosphere. I also considered heat pump warming a subject worthy of post-war planning.

I will content myself with these citations only, but I may add that I could expand upon the subject very considerably.

London, S.W.2. S. B. JACKSON,
Consulting Engineer.

Floor Heating

THE North of Scotland Hydro-Electric Board is co-operating with Mr. J. Blackburn, the burgh architect of Inverness, in the development of house space heating by electric heating elements and cables embedded in the floors. There are now five privately owned houses in Inverness heated by this method and the Town Council is constructing three blocks of all-electric flats which will use the new system. Mr. Blackburn designed and built the first of these houses for himself. No other fuel is used.

The system has proved so satisfactory from the points of view of both cost and comfort that other householders nearby have had this type of heating installed, some using the same system as the original house and the rest another system. The heating is thermostatically controlled and special insulating materials are used in the walls and roofs to conserve the heat.

The cost of installation varies between £69 and £117, according to the size of the premises. The cost of building a fireplace and chimney is in the region of £50 to £100 and in a privately owned house requiring two fireplaces the floor heating system thus results in a saving.

Other important advantages claimed for floor heating are that since there is no fireplace and hearth, there is a big increase in the floor area and much greater freedom to furnish and decorate rooms. There is no danger of children and furniture being burned, no fire-lighting or ash disposal problems, and the absence of dust means that the decoration of rooms lasts longer. There are no draughts, no heat is wasted, and all parts of the rooms are at the same temperature.

Temperature Control Apparatus

NEW FACTORY IN A NEW TOWN

UNTIL a few months ago the manufacturing activities of Electro Methods, Ltd., were carried out in two factories situated some distance apart in North-West London. The company is now well settled under one roof in a new factory in the Stevenage New Town industrial area. This factory has a production area of 10,000 sq ft with a further 1,700 sq ft office block on the same level.

Coincident with the move there was a programme of almost complete re-equipment, involving X-ray inspection apparatus, machinery, benches, process equipment, and office furniture, with the result that the factory is claimed to be the best equipped in the country for its particular type of production. The laboratory is at present staffed by twelve engineers working on developments in the fields of temperature control, magnetic amplifiers, time-delay switches and small power contactors.

For many years the company has been making a wide range of adjustable and fixed contact thermometers for all forms of temperature control applications and for this type of work, which is hand-made to very close limits, the layout of the glass section was the subject of special considerations in order to provide ideal working conditions. For example, while good ventilation was desirable, air draughts on to hot glass had to be avoided, and the screening of the operating position was necessary to provide a light shield for the operator, who would otherwise have had to contend with an invisible flame and resultant eyestrain.

Works and office personnel who numbered 75 at Hendon have now been doubled, and all are housed in Stevenage New Town; 90 per cent of the former employees were attracted from London to Stevenage. Several badly disabled workers are employed.

At present, the main items of production are cartridge thermostats, relays, temperature and humidity control equipment, magnetic amplifiers, low-inertia integrating motors and earth protection units. Among the many buyers of cartridge thermostats is Imperial Chemical Industries, Ltd., which uses them on its "Terylene" plants in this country and in Canada. A wide range of relay systems is produced, including a temperature control relay for use in incubators, sterilizers, pasteurizing and germinating equipment, enamelling ovens, constant temperature baths, etc. Low-inertia integrating motors used in instrument-type servo-mechanisms for driving light loads, for operating mechanical counters performing integration and for use as small power generators are manufactured in four sizes—1·5, 6, 12 and 24 V d.c. The earth protection unit permits unskilled labour to test the earth leads of portable electric tools, prevents the flow of high earth currents, reduces fire risk and operates even with high earth resistance without interfering with existing overload protection.

Other items of production include automatic voltage regulators, mercury switches, solenoids, adjustable contact thermometers, "Terra-tertia" units for continuity tests on electrical appliances and amplifiers for automatic pilots. Experimental work is progressing upon the application of magnetic amplifiers as automatic voltage controllers for generators up to 8 MW, and several types of saturable reactor are being developed.

In the face of keen Continental competition over 40 per cent of the factory's output is destined for export. The company has acquired a further 14,000 sq ft of land and the erection of additional factory premises will begin within the next few months.

General view of assembly shop in Electro Methods new factory at Stevenage

BURNING COLLIERY SLURRY

Method of Utilization in French Power Stations

A JOINT meeting of the British Section of the Société des Ingénieurs Civils de France and the Supply Section of the Institution of Electrical Engineers was held yesterday in London. Its purpose was to discuss a paper by Professor R. Gibrat and Mr. F. Chenin on the transport, preparation and utilization of colliery tailings at the Emile Huchet power station at Carling to the west of the Lorraine coalfield.

The low-grade products, the authors stated, consisted essentially of sludge, powdered coal and middlings; the last-named had been almost eliminated by recrushing in the modern washers used since 1945, and the yield now was almost entirely sludge from the wet process employed in consequence of the high water content of the coal. The recent development of heated screens, however, would enable most of the fines to be separated, thus giving greater quantities of pulverized coal dust. The sludge particles were up to 0·11in in diameter with a large proportion finer than 20 mils; ash content averaged 28 per cent and the water content 30 per cent after draining. Volatile matter was about 25·5 per cent and the ash melting temperature 1,800 to 1,900 deg F.

These low-grade products, representing 15 per cent of the 40,000 tons mined daily, would supply 400 MW at a load factor corresponding to 6,000 hr/year. The generating plant programme provided for a total of 600 MW of plant in two stages, 400 and 200 MW, the second to await further development of the coalfield. This plant was to be installed in two stations, Emile Huchet of 400 MW and one of 200 MW at Grosbliederstroff on the River Sarre to the east of the area. Two 100 MW sets were installed at Emile Huchet in January and December, 1952, the remaining 200 MW being in the planning stage. At the other station the first set was due for commissioning this month and the second by the end of this year.

Boiler Plant

For each of the first two sets at Emile Huchet four boilers were provided, rated at 270,000 lb/hr (normal) and 335,000 lb/hr (maximum continuous) with steam conditions of 1,600 lb/sq in and 990 deg F. These boilers were of the natural-circulation type with water-cooled furnaces equipped with twelve pulverized-coal burners, stepped in three stages and tilting at ±30 deg for superheat regulation. Future sets would probably include single 1,000,000 lb/hr boilers. Soot blowing was by compressed air. Boilers were lit and steam temperature raised by gas from a neighbouring coke-producing plant. The turbine began to operate at 700 lb/sq in, the pressure being increased to 1,530 lb as speed was raised. Sludge containing up to 400 lb of dry product per cu yd was pumped from the colliery by pipeline (mechanical details of which were given) at a cost which was expected to be less than one-third of that by rail, including depreciation.

Drying sludge proved difficult because of its tendency to agglomerate into clods. Pulverized coal crushers would probably be employed in future that could treat directly fuels having a high moisture content. The dryers, of Modave and Buttner design, dealt with fuel having a maximum dampness of 12 per cent by means of heat from the flue gases. More complex designs, which could both crush and dry fuels with a dampness of 25 or 30 per cent, seemed insufficiently adaptable to cope with the demands of an important power plant. The aim was to maintain a dryness of 8 per cent to avoid causing dust in transit to the hoppers. Unburnable residual products amounted to about 1,200 tons daily. Almost all the fly ash formed in the combustion chamber circulated through the whole gas circuit without settling until reaching the Modave hydraulic dust arrestors just before the induced-draught fans.

Up to 1st April last the sludge transport line had delivered 60,000 tons, and experience had shown that no obstruction in the pipeline was likely to cause damage. Starting and stopping pumps had not produced water-hammer trouble and abrasion of the pipeline interior could be avoided. Complete transportation of solid matter necessitated total suspension of all particles in the fluid, none being left to drift along the bottom of the pipeline. Hydraulic transportation, nevertheless, presented the most complex problems in the absence of previous experience and of the lack of progress in theoretical knowledge of the behaviour of solid particles in fluid suspension.

The University of the Future

TO INAUGURATE the Edwin Sibley Webster Professorship in Electrical Engineering at the Massachusetts Institute of Technology, a lecture was delivered by Professor Arnold Tustin of the University of Birmingham. His subject was "Electrical Engineering in a New Kind of University." His thesis was that the education of engineers must first be designed for their full development as mature human beings, with the teaching of applied science as its core. Training was spread over vastly more of a man's life than his years at a university and must be provided for. There must be a broad base of scientific training with only a narrow pinnacle of specialization.

Curricula should be planned to provide training to suit the aptitudes of students. A mastery of at least his own language was an indispensable requirement, together with acquaintance with the main lines of human history and man's evolutionary origins, and the workings of economic systems. Beyond that the concern was not so much with the intellect (which was a tool) as with the vital emotions as they affected personality and the application of all knowledge and understanding to the betterment of the human future. It seemed likely that the chief impact of science on human life during the next 50 years would not be in engineering but in human psychology, the study of which should be included in the university of the future as a branch of pure science. The worlds of science and spirit could not be separated.

The advance of electrical engineering was a basic need for the development of backward countries, first, to secure greater productivity in agriculture such as by the electrical fixation of nitrogen, and then in such primary industries as mining and metal extraction, which would require the economical development of water power, electric power transmission and machinery. Recession and boom in the economic system could be regulated by the application of engineering methods of system analysis, assisted by automatic computers. It was the bringing together of all relevant knowledge of engineers, economists, statisticians and mathematicians in an effort imbued with social purpose that the word "university" found its justification.

NEW ELECTRICAL EQUIPMENT

Power Pallet Truck

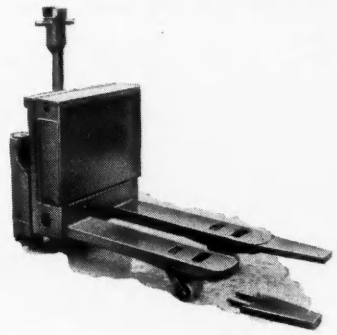
LANSING BAGNALL, LTD., Basingstoke, Hants, have introduced a 3,000 lb power pallet truck which although of high capacity is capable of being easily manœuvred in and out of standard covered railway wagons. The power unit, controls and battery occupy a depth of only 17½in, so that with the standard fork length of 36in the overall length of the truck is only 53½in. Apart from its railway use, the compact dimensions of the truck make it suitable for working in and out of lifts, lorries and congested stores.

The " PP 230 " truck is made with fork lengths of 36, 40 and 48in and neatly fitting fork extensions enable all the usual pallet sizes to be handled. Construction has been simplified by using the weight of the 16 V " Exide Ironclad " battery and container to return the forks from their raised position to the bottom point clear of the pallet. Thus the normal return springs are eliminated and the forks can be raised practically vertically.

Removal of the battery is simple. With the forks in the raised position, legs at the side of the battery box are dropped and latched into position. A simple fastening holding the box in position is released and the forks lowered. The battery is then left standing on its two legs. The truck is pulled out by hand from beneath the battery and, if necessary, moved straight under another charged battery. Changing of batteries is only required for continuous working since the truck incorporates a built-in charger.

The motor and simple chain drive can be exposed for maintenance by removing the front panel and turning the motor by means of the steering handle to obtain access to any desired part. The hydraulic gear and charger are removable as units and can be replaced in case of trouble by spare units. The wheels are readily replaceable.

The electrical circuit follows the established Lansing Bagnall practice, in that regenerative braking is provided to assist in giving smooth control and reducing wear on the mechanical brake. There are five speeds in each direction. Since the control handle, motor and driving wheel are an integral unit with a steering arc of over 180 deg, manœuvrability is good. The turning radius of the truck is only 43½in with 36in long forks.



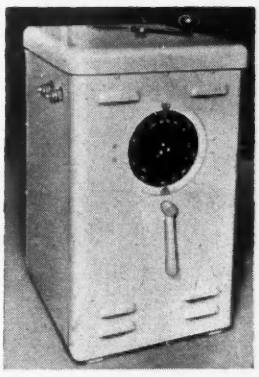
Lansing Bagnall 3,000 lb power pallet truck

Welding Rectifier

The latest dual current welding rectifier (Type 1308/1) to be introduced by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2, is designed to give an output of 40–240 A a.c. or 10–80 A d.c. In both the a.c. and d.c. ranges the output is infinitely variable and a calibrated scale is fitted to indicate the welding current on either of the two ranges. The type of current is selected by the use of a changeover switch. When d.c. is required, the transformer output is fed to two rectifier valves which are protected from premature loading by a time-delay valve and from excessive current input by a micro-switch device operated directly from the shunt mechanism.

The use of valve-rectified d.c. ensures that the welding current is smooth and free from " flickering." Since there is no mechanical inertia and the electrical inertia of the set is low, there is a rapid response and the arc recovery time is short. Oscillograms show that barely 0·002 sec is required for recovery. Most other types of d.c. plants require 10 times as long. The rectifier is suitable for connection to a three-phase 380–440 V 50 c/s supply but can also be supplied for two-phase systems, 200–220 V 50 c/s if desired. The unit measures about 22½in by 24in by 34in high, and the weight is about 385 lb.

Philips dual current welding rectifier



The machine is contained in a well ventilated, stoutly constructed, drip-proof case of pleasing design. The valves are fully spring mounted for arduous service.

Wash Boiler

A wash boiler now being placed on the market by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2, is designed to boil 8 lb of dry clothes in 9⅝ gal water. The steel outer case has a smooth galvanized finish and a non-rusting aluminium lid and top and the interior is of tinned copper. A non-splash chromium-plated top, which can be fitted with a hose, is provided together with a three-heat switch. Total loading is 3 kW, consisting of six 500 W elements, and the boiler is suitable for use on voltage ranges of 200/220 V or 230/250 V, and each boiler is fitted with 3 yd of t.r.s. three-core flexible.

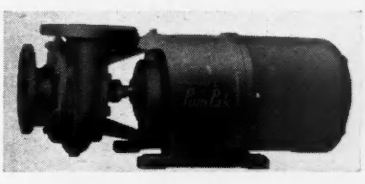
G.E.C. non-corroding wash boiler

The height of the boiler is 27⅛in and it measures 19in in diameter, with a tap projection of 3½in, the total weight being 32 lb. It is available with s.p. switches (DE4753) at a price of £8 19s and d.p. switches (DE4754) at £9 4s. Fitted with a " Jelson " automatic cut-out device (DE4755) the price is £10.

Close-Coupled Pumping Sets

The main features of the " PumPak " range of close coupled electric pumping sets recently put on the market by SIGMUND PUMPS, LTD., Terminal House, Grosvenor Gardens, London, S.W.1, are the ventilation arrangement, the ease of withdrawing

Sigmund " PumPak " close coupled pumping set



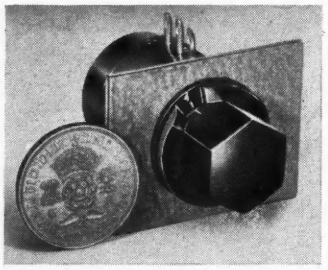
the stator from the motor, and the replacement stator pack service.

The stator housing is such that it can be removed complete with stator without affecting the pump, it being only necessary to disconnect the leads to the terminal box and remove four nuts. Stocks of stators are held at the works so that in the event of an electrical failure developing in the set, a replacement can be dispatched promptly, thereby enabling the pump to resume duty with the minimum of inconvenience to the user.

For ventilation cool air is drawn through the entire motor, by a fan mounted on the pump side of the stator, a stream of which circulates around the pump side bearing, effectively cooling it and preventing entry of liquid into the bearing housing. The "PumPak" range at present covers units from 1½ to 15 h.p. at 1,450 and 2,900 r.p.m. with capacities up to 500 gal/min and heads up to 175ft, but an additional series of fan cooled and small types will shortly be available. In addition to the standard cast iron, bronze fitted pumps, "PumPak" units are supplied with cast iron casing and bronze impeller, all iron construction, all bronze hydraulic parts, and in certain types, with stainless steel hydraulic parts.

Miniature Attenuator

To meet a demand for a midget stud-type attenuator or fader, PAINTON & Co., LTD., Kingsthorpe, Northampton, have introduced a new instrument designated "Type M." Primarily



Painton Type M midget attenuator

designed for audio applications (although in special circumstances it may be satisfactory on carrier frequencies up to 4 Mc/s), the unit measures only 1⅛in in diameter and $1\frac{5}{16}$in long. Painton 0·25 W high stability carbon resistors are employed and the unit can accommodate either a 10-step twin-arm network (e.g., bridge T) or a 20-step single-arm network (e.g., unbalanced potentiometer).

A.C. Switch-Sockets and Plugs

A range of surface mounting and flush type three-pin a.c. switch-sockets and plugs including both 5 A and 15 A models with either single- or double-pole switches has just been put on the market by T.M.C.–HARWELL (SALES), LTD., 37, Upper Berkeley Street, London, W.1. The switch-socket comprises a shuttered three-pin socket conforming to B.S. 546, controlled alternatively on one or both poles by a snap action micro-gap switch mounted beside the socket. All live parts are mounted on a non-tracking moulded base enclosed by a moulded cover or front plate which is recessed to protect the switch dolly. The shutter requires the operation of all three plug pins to expose the phase tubes. The socket tubes are of phosphor-bronze throughout the range, with the exception of the 15 A earth tube which is brass. The plugs incorporate a cord grip of the clamping type.

Leather V-Belt

The "Adjusticon" multi-ply leather V-belt, with flush unbroken driving faces, has been introduced by CAROL BELTINGS, LTD., 12, Gray's Inn Road, London, W.C.1. It is reinforced throughout its length by stainless, evenly spaced tubular metal eyelets, which serve to clamp the plies of the belt, preventing their shearing, and effectively air-cooling the belt. By means of these eyelets and a special fastener, the belt can be easily adjusted for length and tension on any V-belt drive.

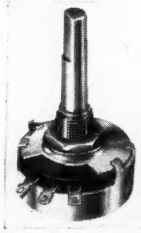
The fastener is held in place by a steel spring plate, and because the overall length is small and the belt-ends abut within the fastener, maximum flexibility and resilience are maintained as well as even and silent transmission, no matter what size of pulley is used. No metal parts come into contact with the pulley groove and the locking device of the fastener can only be released by manipulation.

Moulded Track Potentiometers

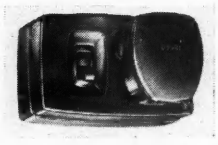
By the introduction of a new technique moulded track potentiometers of 2 W rating have been developed by the PLESSEY CO., LTD., Ilford, Essex. They are suitable for tropical service under normal conditions and the specification of the Radio Components Standard Committee RCS/122 for rotary variable composition carbon resistors has been adopted as the quality standard in their development.

The track is an integral moulding in a groove in the body of the insulated casing. The units are therefore intrinsically stable both mechanically and electrically. Continuity of the track material ensures low track noise. A double carbon brush arrangement minimizes track wear and the increase of track noise due to age.

Track resistance value is determined by the proportions of carbon and chemically inert moulding material, and a very wide range of resistance values is obtainable. Units rated at 100 ohms may be produced as easily as those of more usual values. Low and consistent values of stop and start resistance are readily obtainable, and a maximum production limit of 50 ohms, or 5 per cent, whichever is the smaller, is specified. Special values of hop-on and hop-off resistance can be provided.



Plessey 2 W moulded track potentiometer



"Temco" surface mounting a.c. switch-socket and plug

Radioactive Ore Detector

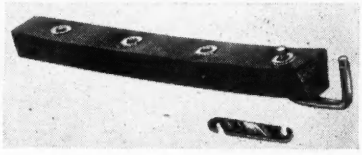
The "Prod" portable radioactive ore prospecting equipment introduced by EKCO ELECTRONICS, LTD., Ekco Works, Southend-on-Sea, Essex, incorporates a Geiger-Muller tube and a miniature high-gain amplifier which, through headphones, gives a clear audible indication of the presence of radioactivity. Weighing only 4¼ lb and measuring 33½in long, this N533 equipment can be easily carried in the hand or slung from the body on a shoulder strap.

The sensitivity is such that radiation from 2 to 3 micrograms of radium at one metre gives a count of 120–150 pulses/sec.

Current consumption is about 100 mA (total) from three 1·5 V cells, h.v. requirements being met by a vibrator-type convertor.

The instrument and batteries are in a laminated plastic tube. A rubber shock absorber forms a protective cap at the end remote from the operator, while the other end is enclosed by a moulded rubber control panel on which is mounted the socket for headphone leads and the on/off switch, the only control.

Ekco radioactive ore-detecting equipment
"Adjusticon" leather V-belt and fastener



VIEWS on the NEWS

By REFLECTOR

IN a television programme last week the age-old question of non-standard plugs and sockets was discussed by Dame Caroline Haslett and Mr. J. H. M. Sykes. Mr. Sykes presented a doleful picture of the straits in which consumers often found themselves because a plug supplied with a new appliance would not fit the available socket. He also suggested that all domestic appliances should be marked with their current consumption so that consumers would know that they could be used on outlets of certain current ratings. Dame Caroline thought that the position was not so bad as it had been made out to be and spoke of the advance made by the 13 A standard all-purpose fused plug. She agreed, however, that progress ought to be quicker and suggested that if the responsible authorities followed the Ministry of Works "Housing Manual" it would be. Mr. Sykes wondered if the Government could not say that after a certain period all socket outlets in new houses should conform to the standard. I doubt it and suggest that electrical contractors should take a hand in advising consumers to install the standard outlet and, incidentally, sell improved installations.

* * *

Mr. G. L. Webb, of Blackburn, has drawn my attention to a report in the *Sunday Times* of a collision in which the B.E.A. collier *Oliver Bury* sustained damage to her bows and stem. It is believed that the other vessel involved was the steamer *Mr. Therm* owned by the North Thames Gas Board. Mr. Webb suggests that this may indicate a new phase in the gas–electricity "war." While I am certain that neither side has proceeded from verbal to physical conflict I can imagine some pungent nautical exchanges upon this occasion.

* * *

Tenants of Nairn County Council's all-electric houses at Auldearn complain of an inadequate supply of electricity which has resulted in extremely low voltages. The convener of the Council's Housing Committee said recently that the problem had become more acute since the installation of electric heaters in Auldearn church. When these were on there was insufficient power left for the Council's tenants to cook their Sunday dinners. It is satisfactory to learn that the position will ultimately be rectified by a new line, for such a contest between kirk and kitchen is most unseemly.

* * *

Sixty years ago, in the issue of the *Electrical Review* of 23rd February, 1894, there appeared a leading article severely criticizing the Heilmann 800 h.p. steam-electric locomotive. This was a design by M. Heilmann, managing director of the Chemin de Fer de l'Ouest, who tried it out on his Havre–Beuzeville line. The Editor of that time did not think much of the economy of a system which interposed a dynamo and motors between the steam engine and the wheels and he found faults with other points. Nevertheless there was a full description of the locomotive in the following issue and a more favourable view seems to have been taken; it was agreed that tests, in which speeds up to 90 kilometres an hour were reached, were "at least encouraging." There were eight motors in two series-parallel groups of four. The motor shafts were steel tubes fitting over the axles "with the interposition of *woodite*, an elastic material that is impervious to oil." The steel tubes terminated at one end in an elastic coupling to prevent jerking at starting. A Lentz type boiler was employed and the steam engine (one h.p. and one l.p. cylinders) drove a six-pole d.c. generator with a normal rating of 400 kW and a diameter over the housing of 2 metres. News of further tests and developments appeared from time to time in the *Review* until 1898 by which time opinion had changed again and the locomotive was said to be looked upon as a "more or less senseless freak." That seems to have been the last reference. Last week's record run of the French C.C.7121 electric locomotive lends added interest to this account of an earlier development.

* * *

I was recently lent a copy of "The Diary of Henry Machyn: Citizen of London, 1550–1563" published in 1847 by the Camden Society. The first entry in the diary (which preserves the original spelling) describes the funeral procession of the Earl of Southampton in 1550 and in it occurs the phrase " . . . then mourners for hym a c powre men having gownes of mantylle fryse." Although, at first blush, this seems to imply (quite impossibly) the presence of his Lordship's generating plant engineers, I interpret it as "a hundred poor men" (which some might say comes to the same thing).

* * *

Honour is paid to Faraday in an extensive way by the South Eastern Electricity Board which has the word "Electricity" in Faraday's handwriting inscribed upon the facias of the service centres throughout its area. The *Star* reports a further tribute to the father of modern electricity. A road at St. Mary Cray, Kent, is being named Faraday Way; the name was suggested by the Board which has a new stores in the road.

* * *

Shillings are still in "short supply" in some parts of the country and again there are tales of opportunists who are supplying them to harassed electricity consumers at a small premium. One way of meeting the difficulty is reported from York where a lady was recently put on probation for three years for using the same shilling for a slot meter 363 times, thereby obtaining £18 worth of electricity.

* * *

Extract from a *Sunday Express* interview with an actress:—

> "When I met her in her dressing room she was radiating doubts and unhappiness like a 40-watt electric lamp."

Evidently the lady was suffering from a lack of volts.

PERSONAL AND SOCIAL

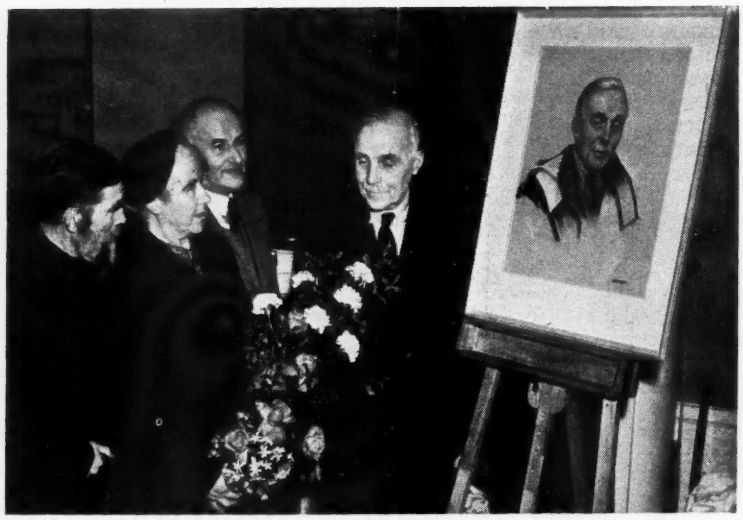
News of Men and Women of the Industry

THE Council of the Institution of Civil Engineers announces that it has appointed **Mr. Alexander McDonald,** B.Sc., M.I.C.E., to the position of secretary of the Institution, to succeed **Mr. E. Graham Clark,** C.B.E., M.C., M.Sc., M.I.C.E., who will be retiring this year.

On 10th February, in the Council Chamber of the Engineers' Association, of Dublin, a group of his past students presented **Prof. F. E. W. Hackett** with his portrait, by Sean Keating (president of the Royal Hibernian Academy), to mark his retirement from the Chair of Physics and Electrical Engineering at University College, Dublin. Prof. J. J. Morrissey, Professor of Electrical Engineering, University College, Dublin, presided at the meeting, Mr. D. McAteer, A.R.C.Sc.I., and Prof. T. S. Wheeler, Professor of Chemistry, University College, Dublin, making the presentation. Among those present were Messrs. B. O. Mongain, Engineer-in-Chief, Department of Posts and Telegraphs, P. J. Dowling, past-chairman of the Irish Branch of the Institution of Electrical Engineers, G. Ring, R. L. S. McDowell, P. Harkin, A. J. Litton, R. A. H. Jackson, P. G. Boyd and J. O'Dea.

Prof. Hackett was recently elected president of the Royal Dublin Society. He was appointed Professor of Physics in the College of Science, Dublin, in 1922 and in 1924 upon the merger of the College of Science with University College, Dublin, became Professor of Physics and Electrical Engineering in University College. In 1932 he was elected to the Senate of the National University of Ireland. Prof. Hackett was president of the Engineers' Association in 1937.

Presentation to Prof. F. E. W. Hackett showing (left to right), Mr. S. Keating (president, Royal Hibernian Academy), Mrs. Hackett, Mr. D. McAteer and Prof. Hackett



Mr. K. R. Laurence has been appointed general manager of Winston Electronics, Ltd. He will have under his charge the whole group of Winston companies which includes Winston Metal Fabrications, Ltd., and the Edlin Electrical Co.

Mr. A. Trickett has been appointed assistant sales manager to W. T. Glover & Co., Ltd. He received his initial training with Callender's Cable & Construction Co. (Anchor works)

Mr. A. Trickett

which he joined in 1915. He transferred to the sales organization in 1922, was appointed outside sales representative in 1925 and subsequently established its Preston Branch in 1943. Following the amalgamation of the Callender's and British Insulated interests he took charge of the Blackburn and Preston Branch and in 1953 was appointed Manchester branch manager.

Mr. H. Hilton, A.M.I.E.E., second assistant engineer (operation and maintenance), No. 2 Sub-Area, North Western Electricity Board, has been appointed senior assistant engineer (operation and maintenance) No. 6 (Hull) Sub-Area of the Yorkshire Electricity Board, and takes up his new duties on 1st March. Before joining the North Western Board in 1950, Mr. Hilton was with the Tyne Sub-Area of the North Eastern Electricity Board.

Mr. H. Hilton

Mr. J. C. G. Jones, turbine room superintendent at Kearsley, North Western Division, B.E.A., has been appointed deputy superintendent at this station and will commence his new duties on 1st March. Mr. Jones has been turbine room superintendent since November, 1948, and was previously charge engineer at Kearsley and Radcliffe stations.

Mr. C. A. Cameron Brown, B.Sc., M.I.E.E., agricultural electrification adviser, British Electricity Authority, is a member of a United Nations technical assistance mission which is going to Turkey at the request of the Turkish Government to advise on rural electrification. The mission will be led by Mr. Sevette, chief of the Electric Power Section of the United Nations Economic Commission for Europe. Mr. Cameron Brown together with Mr. F. Gillis (Belgium) will be concerned with utilization matters.

Mr. J. de Gruchy has resigned his position as head of the Instrument Department of the Electrical Apparatus Co., Ltd., and has commenced on his own account as the Clare Instrument Co.

Mr. W. T. Litchfield, who was with the English Electric Co. for seventeen years, has joined the Publicity Department of Thorn Electrical Industries, Ltd.

The honorary degree of Doctor of Laws is to be conferred in May by the University of Manchester on **Sir Arthur Fleming,** director of research and education, Associated Electrical Industries, Ltd., and **Sir Joseph Hallsworth,** chairman of the North Western Electricity Board.

The Minister of Fuel and Power has appointed **Mr. D. P. Sayers,** B.Sc.(Hons.), M.I.E.E., M.I.Mech.E., to be deputy chairman of the Midlands Electricity Board, with effect from 1st March, in succession to **Mr. D. H. Kendon,** B. Sc. (Eng.), M. I. E. E., M.I.Mech.E., who, as we have already reported, is now chairman of the Merseyside and North Wales Electricity Board. Mr. Sayers was chief engineer of the Midlands Electricity Board from 1948 to 1949 when he was appointed to his present post of deputy chief engineer (transmission) of the British Electricity Authority. Previously he was successively deputy distribution engineer, distribution engineer and later chief assistant engineer of the Sheffield Corporation electricity undertaking from 1936 to 1943, and then deputy chief engineer and manager of the Birmingham city undertaking until nationalization.

Mr. D. P. Sayers

The British Electricity Authority is inviting applications for the position of deputy chief engineer (transmission) in the Chief Engineer's Department which Mr. Sayers is vacating. The salary will be within the provisional scale, £3,000 rising by annual increments of £125 to £3,500.

Metropolitan-Vickers Electrical Co., Ltd., announces that following the transfer of **Mr. W. L. Beeby** to the Edison Swan Electric Co., Ltd., **Mr. C. H. Smith,** A.M.I.Mech.E., was appointed works engineer as from 1st November last. **Mr. J. H. Phillips** has been appointed assistant works engineer.

Mr. Smith was educated at Bromsgrove County Grammar School and Birmingham Technical College. Following an apprenticeship with the Austin Motor Co., Ltd., Birmingham, and experience in the Works Engineer's Department, he became assistant works engineer. He joined the Metropolitan-Vickers Co. as assistant works engineer in 1946.

Mr. Phillips, following technical education and an engineering apprenticeship, obtained early experience in a steelworks in South Wales. He joined the Metropolitan-Vickers Co. in 1927 as a maintenance draughtsman in the

Mr. C. H. Smith

Mr. E. G. Batt

Works Engineer's Department, and became maintenance engineer of the Mosley Road Works in 1946.

The British Refrigeration Association announces that its director and secretary, **Mr. E. G. Batt,** is retiring on 31st March next. He has held this position for the past seven years, before which he was independent chairman of the Association. His services will be available to the Association in a consultative capacity. The B.R.A. has placed on record its appreciation of the valuable services which Mr. Batt has rendered.

At a meeting of the Council of the Association held on 14th January, **Mr. R. H. Hemmings** was re-appointed chairman for 1954. Mr. Hemmings is a director of York Shipley, Ltd.

Mr. W. K. Allen, M.(Eng.), A.M.I.E.E., A.M.I.Mech.E., was appointed general manager of the Jersey Electricity Co., Ltd., early in 1953, on the retirement of Mr. H. H. Longson, and later in the year became managing director.

Mr. Allen, who is 41, served his apprenticeship with the Macintosh Cable Co., Ltd., and British Insulated Callender's Cables. He studied mechanical and electrical engineering at Liverpool University and graduated with first class honours in 1934 and two years later took the M.(Eng.) degree. He joined the North Wales Power Co. in 1934 as transmission and distribution assistant and later became assistant to the development and sales manager. In 1937 Mr. Allen went to Woolwich Corporation and in 1939 joined the Northampton Light and Power Co. as

Mr. W. K. Allen

district engineer, Towcester. Later he went to head office as deputy to the rural mains engineer and was responsible for operation, maintenance and construction work over a large area. He went to Jersey in 1947 as deputy manager. He has travelled extensively to study the operation of electrical utilities in various parts of the world.

Mr. D. C. Espley, O.B.E., D.Eng., M.I.E.E., chief engineer (telecommunications) at the research laboratories of the General Electric Co., Ltd., has recently been elected a Fellow of the American Institute of Radio Engineers with the citation "For his creative contributions to microwave and television techniques in England.

Mr. A. E. Iliffe, director and general sales manager, the Benjamin Electric, Ltd., left for an overseas business tour on 24th February. His object is to make contact at director level with the

Mr. A. E. Iliffe

main distributors and to further the interests of better lighting. He is visiting India, New Zealand and Australia with a few days in Singapore en route and expects to be back in London towards the end of June.

Mr. J. N. Dean, deputy chairman of the Telegraph Construction & Maintenance Co., Ltd., left London on 22nd February by air for Johannesburg to visit Telcon's subsidiary company in South Africa, Telcon Cables (S.A.) (Pty.), Ltd. He will be away for about 10 days.

The annual presentation concert of the **Telcon Social & Athletic Club** was held on 17th February. Prizes and trophies for indoor and outdoor games and long service certificate awards (15 and 25 years) were presented by Lord Colgrain, chairman of the Telegraph Construction & Maintenance Co., Ltd. The concert which followed was given by the Telcon Concert Party. Among those present were the Hon. Marjorie Campbell, Mr. J. N. Dean (deputy chairman), Mr. J. Innes, C.B., Mr. B. H. Musgrave (directors), Mr. F. Leighton (president of the club and general works manager), the divisional managers, and their ladies.

The **Radio Industry Council** has announced the award of premiums of 25 guineas each for articles published in the public technical Press during 1953 to the following: Messrs. G. G. Gouriet, A.M.I.E.E.; A. W. Keen, A.M.I.E.E., M.I.R.E.; A. H. Beck, B.Sc.(Eng.), A.M.I.E.E. and A. D. Brisbane; D. McMullan, M.A., Ph.D.; H. M. Davis, B.Sc., A.R.I.C. and Miss J. E. Seaborn, B.Sc.; and J. R. Pollard, M.A., A.M.I.E.E., M.I.R.E. The judges at present for-

ming the panel are: Professor Willis Jackson, D.Sc., D.Phil., M.I.E.E., F.Inst.P.; Mr. P. D. Canning; Mr. W. M. York, F.I.A.M.A.; Mr. C. E. Strong; and Vice-Admiral J. W. S. Dorling, C.B., M.I.E.E.

The presentation of the awards will take place at a luncheon to be held by the Public Relations Committee of the Council on 11th March.

Mr. G. E. Liardet, chairman and managing director of Simms Motor Units, Ltd., was entertained to dinner at Verreys Restaurant, London, on 10th February by many of his colleagues to commemorate the completion of his twenty-five years of service with the company.

Mr. Liardet started work in the Simms Repair Shop at Foley Street in 1929. Later he became manager of the company's Edinburgh Branch, and was appointed sales manager in 1933. Mr. Liardet was appointed a director in 1943, joint managing director in 1950, and chairman and managing director in July last. Mr. A. Piggott, sales manager, presented Mr. Liardet with a case of pipes. Mr. Liardet thanked his hosts for their gift and for their loyal assistance.

Mr. G. E. Liardet

Mr. L. M. Reay

Mr. Leslie M. Reay, M.B.E., has been appointed London sales manager for the Electric Motor Division of Newman Industries, Ltd. Mr. Reay has been with the company for five years as a sales engineer in the London area. During the war he served with the Royal Engineers. Before the war he was with Frigidaire, Ltd., and the Dominion Rubber Co.

At the meeting of the Railway-Traders panel on 18th February, **Mr. P. V. Gurr,** J.P., district manager, Folkestone, South Eastern Electricity Board, was reappointed chairman. The panel consists of representatives of the Town Councils and Chambers of Trade in Kent, Surrey and Sussex and Mr. Gurr is the representative of the Folkestone Chamber.

Mr. A. B. Owles, of the British Electricity Authority, North Western Division, retires from his duties as divisional chemist on 8th March. Mr. Owles joined the staff of the Stuart Street power station, Manchester, in 1911 as one of the first power station chemists in the country. He now controls the seventeen laboratories in the North Western Division. Since their inception in 1928, Mr. Owles has served on committees and panels of the British Standards Institution proposing specifications for the sampling of coal and coke. He was a member of

Mr. A. B. Owles

the Technical Committee of the Electricity Commission whose report in 1932 laid down recommendations for methods of reducing the emission of dust from power stations, and he represented the Incorporated Municipal Electrical Association on B.S.I. committees dealing with the classification and testing of various oils.

Councillor J. D. Beard, managing director of Beard Electrical, Ltd., Tipton, has been nominated as the next Mayor of Oldbury (Birmingham).

Mr. D. Flockhart has been appointed assistant generation superintendent at the Trinidad & Tobago Electricity Commission's Penal station. Mr. Flockhart joined the Commission's service last year, having formerly been a charge engineer at the B.E.A.'s Falkirk power station.

Mr. A. Bull, of the Export Mining Department of Oldham & Son, Ltd., left London Airport on Sunday for a three months' tour of overseas markets. He will visit India, Malaya, Australia, New Zealand and the Far East, returning by way of Canada and the United States.

Sir Rex Hodges, who is retiring from the position of general manager and secretary of the Mersey Docks and

Sir Rex Hodges

Harbour Board in March, is joining the board of British Insulated Callender's Cables, Ltd., as from 31st March.

The speaker at the next luncheon meeting of the **Electrical Industries Club** (Connaught Rooms, London, W.C.2, 9th March) will be Mr. J. B. Scott (Crompton Parkinson, Ltd.) who was the leader of the recent trade delegation to Moscow. He will speak on "The Possibilities of East-West Trade."

The recently formed Dramatic Society of the **Liverpool Electric Cable Co., Ltd.,** gave its first performance on 4th and 5th February when it produced the play "Forced Landing" at Lathom Hall, Seaforth. The company held its annual dance at Bootle Town Hall on 12th February.

OBITUARY

Mr. John Rogers, who died on 15th February, aged sixty-one years, had been associated, although not continuously, with the English Electric Co., Ltd., for forty years. From 1938 until last year, when he was granted indefinite leave because of poor health, he had been general manager of works for the company and a director of the English Electric Export & Trading Co.

Mr. Rogers served an apprenticeship with Willans & Robinson at Rugby, on completion of which he followed a career on the production and management side of the works. From 1927 to 1936 he was with Fiat British Auxiliaries, Ltd., but returned to the English Electric Co. as general manager at Stafford, and two years later (in 1938) he became general manager of all the company's works.

Mr. Rogers served on the Ministry of Supply's Industrial Advisory Panel and was a member of several industrial organizations. He leaves a widow and two sons. One of his sons, Mr. J. R. Rogers, has been welfare officer at the Rugby works of the English Electric Co. since 1951 and the other, Mr. Robert Rogers, is with the company in the Far East.

Mr. William Young, A.M.I.E.E., a former deputy borough electrical engineer of Stepney, died in hospital on 7th February at the age of eighty-one. Mr. Young entered the supply industry in 1893 in the Brighton electricity undertaking and subsequently took up an appointment with the old Whitechapel Board of Works in 1899 at the initiation of its undertaking which was subsequently merged in the Borough of Stepney. He retired in 1933.

M. René Barthelemy.—The death is reported from Paris, on 16th February, of M. René Barthelemy, a pioneer of French television. He commenced the study of radio circuits in 1910 and fifteen years later turned his attention to television, becoming in 1928 chief engineer of the French Television Experimental Centre at Montrouge. His experiments led to the creation of one of the first television posts in France in the Eiffel Tower in 1936.

WILLS

Mr. W. R. Rawlings, A.M.I.E.E., formerly managing director of Rawlings Bros., and a director of Sun Electrical Co. and the Rawlplug Co., who died on 18th October last, left £50,857 gross (£49,172 net).

Mr. W. Moss, chairman of H. Frost & Co., electrical appliance manufacturers, Walsall, who died on 10th September last, left £23,521 gross (£23,265 net).

OVERSEAS ELECTRICAL TRADE

Exports Maintained in January

A CONSIDERABLE rearrangement of the monthly accounts published by the Board of Trade relating to trade and navigation of the United Kingdom (H.M. Stationery Office, 12s 6d) extends the details concerning electrical products and puts them in much more logical order. Electrical machinery has been transferred from the general machinery section and has been given pride of place in the "Electric Machinery, Apparatus and Appliances" division, which now also includes vacuum cleaners, tools and electrical porcelain, as well as a number of new classifications such as toasters, water heaters, fans, floor polishers, food mixers, hair clippers and dry shavers, and welding equipment. It is a pity that in the process of rearrangement the opportunity could not also have been taken to remove washing machines, specifically classified as electrically operated, from the "Machinery other than Electric" division to the electrical section, together with such other items as electric locomotives, welding electrodes and electric conduit. Surely, too, it might have been possible to show separately electrically operated models of refrigerators and certain other apparatus now included under general machinery.

In January the total exports of electrical machinery, apparatus and appliances were valued at £14,957,845, compared with £15,806,517 in January, 1953. The various articles covered are listed in Table I, destinations being given in Table II. Among the items not included in the figures are:—Washing machines, not exceeding 150 lb weight, £298,005 (£162,194 in January, 1953); ditto, over 150 lb but not exceeding 250 lb, £98,030 (£130,428); ditto, parts, £33,187 (£27,566); welding electrodes (excluding carbons), ferrous, £71,104 (£107,336); ditto, non-ferrous, £15,713 (£41,923); and electric conduit tubes and cased tubes, £65,411 (£81,637). Adding in these exports January's total comes to £15,538,295, which is comparable with £15,118,228 for December. A new classification has been introduced for electric locomotives, exports of which were valued at £360,934 last month against £66,705 in January, 1953.

Apart from the general analysis of electrical exports by

TABLE I.—ELECTRICAL EXPORTS

Class	January, 1954	January, 1953
	£	£
Diesel-driven generating sets, not exceeding 10 kW	117,990	94,504
Ditto, over 10 kW to 65 kW	116,305	125,336
Ditto, over 65 kW to 200 kW	52,634	115,525
Ditto, over 200 kW	341,702	91,475
Spark ignition engine driven generating sets	15,662	28,163
Steam turbine driven generating sets	6,811	104,168
Other prime mover driven generating sets	97,669	37,707
Generators	200,567	525,345
Parts of generators	605,586	659,555
Motors, other than railway, tramway and trolley-bus, not over ½ h.p.	169,885	123,155
Ditto, over ½ h.p. but under 1 h.p.	42,774	39,564
Ditto, from 1 to 250 h.p.	419,051	470,080
Ditto, over 250 h.p.	101,347	125,116
Railway, tramway and trolley-bus motors, and parts	182,318	143,092
Motor starting and controlling gear	218,509	288,268
Converting machinery	22,596	20,584
Mercury-arc rectifiers	83,405	45,665
Transformers for lighting, heating and power (incl. coils)	1,082,952	993,741
Switchgear and switchboards (excluding telegraph and telephone)	1,249,119	1,287,925
Primary batteries for lighting	82,304	46,534
Ditto, for radio	128,527	73,671
Ditto, other	46,320	47,653
Battery parts (excl. carbons)	60,773	22,366
Lamps exceeding 24 V	68,391	63,492
Ditto, not exceeding 24 V	41,620	20,013
Discharge lamps, fluorescent tubes, etc.	60,891	44,953
Other lamps	93,111	21,622
Cathode ray tubes	7,889	8,251
Other valves (not X-ray), not exceeding 50 W anode dissipation	141,164	161,659
Radio and television transmitters	26,911	15,828
Commercial radio and radar equipment	907,652	790,830
Domestic radio receiving sets, mains	164,106	223,070
Ditto, battery	54,499	49,948
Ditto, other (incl. car)	12,363	17,764
Radiograms	24,490	47,563
Television sets	5,340	1,713
Public address equipment	63,927	52,027
Sound reproducing apparatus, n.e.s.	15,150	12,274
Components and parts, n.e.s., including parts of electronic valves and cathode ray tubes	548,221	422,813
Telegraph and telephone installations	504,041	722,876
Telephone instruments, separately consigned	126,228	211,153
Telegraph and telephone parts	609,844	738,476
Line apparatus for long distance communication	205,382	132,330
Cookers	50,564	50,955
Toasters	6,092	18,982
Other cooking appliances	21,220	19,919
Parts and accessories	27,034	26,979
Space heating appliances	17,089	18,605
Water heating appliances	32,738	33,827
Other heating appliances	34,652	27,810
Parts and accessories	47,543	54,930
Irons	50,831	37,062
Arc welding equipment, a.c.	44,311	51,196
Ditto, d.c.	28,303	51,502
Resistance welding equipment	7,815	8,357
Magnetos, ignition	9,750	30,024
Sparking plugs	168,476	130,378
Appliances for aeroplanes, n.e.s.	169,731	88,877
Ditto, for motor vehicles, n.e.s.	206,642	215,317
Ditto, for cycles, n.e.s.	89,919	51,878
Signalling apparatus (incl. traffic signals)	54,093	74,124
Industrial radio-frequency equipment	25,543	19,025
Bell apparatus (excl. telegraphic or telephonic)	4,928	7,435
Instruments, commercial	167,336	128,592
House service meters, not prepayment	108,417	92,460
Ditto, prepayment	11,351	10,604
Electro-medical apparatus (not X-ray)	45,096	35,240
X-ray apparatus (excl. tubes and valves)	49,062	107,273
Vacuum tubes	26,254	28,094
Desk fans	28,338	40,861
Ceiling fans	106,817	135,406
Vacuum cleaners	189,958	95,274
Floor polishers	85,321	45,988
Food mixers	30,399	38,493
Hair clippers and dry shavers	25,622	36,865
Other portable appliances	20,710	22,088
Parts	62,623	56,546
Portable power tools (excl. saws), electrical, incl. parts	125,557	164,429
Telegraph and telephone cables and wires, submarine	97,175	12,171
Ditto, other	490,377	644,599
Ditto, cotton, silk or artificial silk insulated	34,382	109,978
Ditto, enamel, glass or asbestos insulated	73,110	101,641
Ditto, paper insulated	791,697	1,329,920
Ditto, rubber insulated	366,642	538,176
Ditto, other	228,438	399,886
Accumulators for motor vehicles	141,043	145,168
Ditto, traction	22,820	12,201
Ditto, radio and other portable accumulators	34,393	41,092
Other accumulators	84,872	54,693
Parts and accessories	58,739	65,144
Electrical porcelain, etc. (incl. insulators)	102,042	88,809
Insulating cloth and tape	43,515	39,953
Other insulating material	78,674	57,722
Permanent magnets	26,631	36,293
Radio, telegraph and telephone testing equipment, n.e.s.	28,227	23,927
Scientific electrical instruments (excl. telegraphic and telephonic)	213,548	147,932
Electrical machinery, n.e.s.	122,288	54,042
Electrical apparatus and appliances, n.e.s.	613,071	579,928
TOTAL	14,957,845	15,806,517

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Destination	January, 1954	January, 1953	Destination	January, 1954	January, 1953	Destination	January, 1954	January, 1953
	£	£		£	£		£	£
Channel Islands	59,976	45,789	Barbados	8,464	28,483	French Morocco	22,542	11,719
Gibraltar	9,122	13,526	Trinidad	109,677	55,144	Angola	19,750	29,753
Malta and Gozo	66,456	14,921	British Guiana	26,925	28,318	Portuguese East Africa	27,238	29,723
Cyprus	77,644	46,094	Anglo-Egyptian Sudan	120,345	93,364	Syria	12,051	17,235
Sierra Leone	10,573	11,479	Other Commonwealth countries	126,466	116,921	Lebanon	27,123	28,108
Gold Coast	79,073	92,925	Irish Republic	283,324	469,571	Israel	35,385	13,593
Nigeria	127,901	192,423	Soviet Union	370,521	12,315	Jordan	10,064	7,636
Union of South Africa	1,496,307	2,083,002	Finland	155,268	105,178	Egypt	85,844	178,683
Northern Rhodesia	82,246	171,208	Sweden	271,524	249,170	Libya	4,547	13,778
Southern Rhodesia	131,339	327,305	Norway	223,130	342,653	Saudi Arabia	48,475	19,961
Tanganyika	39,700	31,589	Iceland	9,828	486	Iraq	323,636	191,373
Kenya	293,587	314,758	Denmark	206,078	78,559	Iran	27,141	23,074
Uganda	91,747	53,504	Poland	191,042	77,459	Burma	153,298	62,771
Nyasaland	7,189	14,414	Western Germany	99,448	84,162	Thailand	23,822	114,689
Mauritius	23,804	25,123	Netherlands	469,838	418,190	Indonesia	46,552	88,426
Aden	119,548	137,058	Belgium	353,454	308,300	Japan	68,941	28,815
Bahrain, Qatar and Trucial Oman	92,161	89,153	France	250,177	202,840	United States of America	263,766	156,694
Kuwait	218,859	152,952	Switzerland	82,193	66,303	Cuba	20,399	16,406
India	1,688,116	1,717,024	Portugal	221,627	99,679	Mexico	27,946	30,242
Pakistan	722,671	316,293	Spain	238,316	390,447	Colombia	62,715	36,577
Singapore	199,740	319,701	Italy	235,785	211,854	Venezuela	165,515	114,359
Federation of Malaya	183,938	312,979	Austria	101,376	49,426	Peru	37,838	17,099
Ceylon	127,410	156,248	Czechoslovakia	7,768	13,423	Chile	19,945	51,377
British North Borneo	27,927	33,699	Yugoslavia	70,776	30,201	Brazil	65,681	130,059
Hong Kong	152,365	239,907	Greece	53,097	107,358	Uruguay	67,592	10,495
Australia	1,251,382	1,930,217	Roumania	27	65,937	Argentine Republic	151,804	10,532
New Zealand	732,304	744,031	Turkey	64,006	225,368	Other foreign countries	133,759	151,005
Canada	414,143	622,428	Netherlands Antilles	6,625	18,394			
Jamaica	95,087	47,602	Belgian Congo	25,056	15,480	Total	14,957,845	15,806,517

destinations, the chief markets are given for a number of the main individual classifications. Australia (£441,474), South Africa (£221,183) and India (£204,841) were the biggest buyers of generating sets, generators and motors, the total exports of which amounted in value to £2,688,810. Of the £2,438,072 worth of converting machinery, mercury arc rectifiers, transformers, switchgear and switchboards sent overseas South Africa took £634,003, India £389,237 and Australia £186,656 worth. India and Pakistan were the best markets for valves, taking an almost equal quantity, £181,548 and £181,344 worth respectively. India (£340,504) bought nearly twice as much telegraph and telephone equipment as the next largest purchaser, New Zealand (£175,700), and also nearly twice as much cables, wires, etc., as South Africa (£318,302, compared with £176,686).

Of the £1,138,495 worth of electrical machinery, apparatus and appliances imported (compared with £704,649 in January, 1953) the Netherlands supplied £368,058 and the United States £188,519 worth. Items included were valves (£130,588), cathode ray tubes (£121,021), radio communication and navigational aid equipment, including radar (£141,861), other apparatus for telegraphy, telephony, radio, television and radar (£145,489), magneto, ignition and electrical appliances for aeroplanes, motor vehicles and cycles (£128,178).

CONTROL CIRCUITS

I.E.E. Students' Papers

THREE students' papers on: "Electronic Motor Control," by A. O. Dalton; "Arc-Quenching Circuits," by B. H. Stonehouse; and "Contact Rectifiers," by D. R. Smith, were presented at the Institution of Electrical Engineers on 18th February.

The author of the first paper discussed variable speed a.c. machines, such as induction motors with variable rotor resistance and commutator induction motors employing brush separation; the former, he pointed out, had a low efficiency with speeds dependent on the load, whilst the latter had a shunt characteristic with a good efficiency, the speed falling with increased loads at low speeds. The alternative of a Ward-Leonard set was large, expensive and not as versatile as electronic motor control.

In a simple method of control giving a speed range of about 3 : 1 a full wave rectifier employing gas-filled diode valves supplied a d.c. shunt motor equipped with a field regulator.

Armature and field supplies were usually separated, the field being fed from either a vacuum diode or gas-filled diode full wave rectifier and the armature from a gas-filled triode, i.e. thyratron full wave rectifier. By control of the voltage applied to the grids of the thyratrons the armature current and hence the speed of the motor could be controlled.

The instant at which the thyratron valve became conducting depended upon the potential applied to the grid. Once the valve fired it would continue to conduct until the anode potential fell to the extinction voltage, irrespective of the subsequent values of potential the grid might attain.

The angle of lag of the grid potential might be varied by a saturated reactor consisting of a laminated core wound with an a.c. and a d.c. winding. Varying the current in the d.c. winding altered the reactance of the a.c. winding. If the field were constant, the armature back e.m.f. was proportional to the speed.

A method of control was shown by which the maximum motor current could be limited so that the machine would run up to speed without starting resistances and could be stalled without damage. The principle of the current limit circuit was the application to the grid of a triode valve of a standing negative bias. For any given position of the potentiometer slider, the voltage applied to the grid was proportional to the armature current and was connected in opposition to the standing bias on the valve. When the armature current exceeded that corresponding to the potentiometer setting, the valve would conduct, the anode current effecting a decrease in the thyratron current.

Normal speed ranges were 50 : 1 without field control and 200 : 1 with field control, with an accuracy of about 1 per cent. In an alternative method of thyratron control, the 90 deg phase shift circuit consisted of two parallel branches each comprising a resistance and capacitor in

series across the secondary of a transformer. The d.c. component of the thyratron grid potential was provided by the voltage appearing across the capacitor. The normal speed range for such a circuit was 30 : 1 and the method could be used for three-phase machines up to 45 h.p. In all the thyratron circuits delay circuits must be provided to allow the thyratrons to reach the correct operating temperature before the application of anode voltage.

A further increase in speed could be obtained by " field weakening " by grid control of the associated thyratrons. Full field must exist at starting and on overloads to obtain the maximum torque. Distortion of the current waveform by thyratron grid control resulted in a low power factor at low speeds when armature voltage control was used, the maximum torque of the machine being practically constant.

For speeds above 50 per cent of full, with field weakening, a constant horse-power output was obtainable at constant power factor. For machines between 45 h.p. and 600 h.p. ignitrons might feed the armature from a three-phase supply owing to their high current rating, permitting a normal speed range of 100 to 1 with an accuracy to within 0·5 per cent by the use of a tachometer generator.

With mercury arc rectifiers without grid control and with a fixed output voltage a speed range of 3 : 1 was obtainable by means of a motor-field regulator. Using electronic grid control in a similar manner to that used for thyratrons, a variable voltage output was obtained to give the required speed control.

ARC-QUENCHING CIRCUIT

The second paper was mainly concerned with arcing at the contacts of relays or contactors when making or breaking medium and light currents.

The desirable properties of circuits designed to reduce arc currents rapidly and to minimize voltage across the opening contacts were given as: the effective prevention of arcing at both opening and closing of the contacts; inappreciable effect on the rate of rise or decay of the current in the main circuit; simple, dependable and cheap components.

The current density in the short bridge of liquid metal drawn out between contact faces on parting was such as to cause an explosion producing many ions and electrons in a small gap and leaving hot spots on the two faces. What happened subsequently was governed by: speed of contact separation, which affected the arc duration; contact material and the condition of the contact faces; the value of current flowing before the break; and the characteristics of the circuit being broken. The discharge could be roughly divided into arcs, glow discharges and sparks.

In an arc a relatively steady state was reached, and in air had a static voltage–current characteristic with a negative slope. The voltage drop across the arc decreased with increasing values of current and minimum voltage and current conditions were required to maintain the arc. A spark was a transient discharge in which stable conditions were never reached and the slope of the voltage–current curve might be positive.

In an extensively used quenching circuit a condenser was connected in parallel with the contacts. The discharge became a brief spark when the capacitor exceeded a critical size. When fed from an inductance, a capacitor and an arc in parallel formed an oscillatory circuit, the capacitor being successively charged to a voltage sufficiently high to break down the contact gap and then rapidly discharged through the arc. Owing to the negative slope of the arc voltage–current characteristic, the arc could not maintain itself in parallel with the capacitor, and so died out. Unless the load inductance was very small the critical capacitance was almost independent of inductance, rate of contact separation and supply voltage, its value varying as the square of the initial current.

The capacitor connections had a small unavoidable self-inductance which limited the initial current to the capacitor. During this delay period before the capacitor became effective, an arc would almost certainly be struck momentarily. To limit the high initial discharge current a series resistor might be used, but arc instability would not be achieved if the value of the resistance exceeded the negative resistance slope of the arc characteristic at the working current. At high values of current the smallness of the slope prevented the insertion of sufficient resistance to restrict the arcing so the circuit was normally restricted to medium values of current.

For circuits taking more than 1 A the size and voltage rating of the capacitor often became uneconomic, while the high voltage to which it was charged might cause insulation breakdown elsewhere in the circuit. To overcome this difficulty the capacitor could be shunted by a resistance preferably of the non-linear silicon carbide type in which the current varied as the fifth power of the applied voltage. Such a resistor might pass 5 A at 1,000 V and only 5 mA at 220 V.

The connection of a resistor shunt across the load had the disadvantage that the voltage appearing across the contact gap was the sum of the supply and the resistance voltages.

A resistor-capacitor combination of this form might either completely suppress the arc or make the arcing time negligible. Its main advantage was, however, that a medium voltage capacitor could be used only slightly larger than the critical need, limiting voltage peaks to a known value. Recent work indicates that an initial spark of extremely short duration visible only at 10 amps and above, would be almost certainly struck. To prevent further sparking the subsequent rise of volts across the capacitance value must be less than the breakdown voltage of the contact gap and was approximately proportional to the initial current, and varied inversely as the initial speed of contact separation. Thus the higher the speed of initial separation the smaller the capacitor required.

Half-wave rectifiers connected in shunt across the inductive load reduced arcing in some d.c. circuits so that normally only a minute amount of reverse current flowed. If the inductive voltage produced on opening the contacts exceeded the resistance drop in the coil the excess voltage would drive a current through the rectifier, limiting the rate of change of current in the load so that no appreciable over-voltages were produced.

Whether a high or low current arc is struck depends upon the speed of opening of contacts, value of current flowing, inductance of the rectifier connections and self-capacitance of the rectifier. The self-capacitance of the dry-plate rectifiers normally used is sufficient to cause instability of low current arcs.

If the arc reaches stable conditions before the inductive voltage reaches a value equal to the resistance drop in the load, the subsequent rate of change of current would be slow. The rectifier would not conduct any current, and the whole circuit would behave as though the rectifier was not present. Thus the rectifier had the desirable property of preventing a high voltage appearing across the contacts or coil, but not necessarily of modifying or suppressing an arc. If the load is a relay coil, the slower resultant fall in current occurring might undesirably lengthen the relay " drop-off " time. This might be improved by including a small resistance in series with the rectifier.

CONTACT RECTIFIERS

The final paper dealt with methods of rectification to d.c. at from 100 to 500 V without the losses incurred in a mercury arc rectifier due to an arc drop of about 20 V. With the contact rectifier, mechanically operated switches were closed or opened to permit or prevent the flow of current. As there was no arc drop a high efficiency was maintained even below 100 volts.

The contacts operated at the frequency of the a.c. supply, viz., 3,000 times a minute and to avoid reduction of their life the contact current must be substantially zero.

In the contact rectifier the valve elements were replaced by switch contacts. The contact of the incoming phase was closed at the instant of intersection of the phase voltages, while the contact in the outgoing phase had to be opened several degrees later when the current in it reached zero. In a rectifier supplying 15,000 A, the rate of change of

current during commutation might be 20 million A/sec. To open the contact at current zero would therefore require an unobtainable precision of switching.

If a saturating reactor with a sharply defined point of saturation were connected in series with the contact, a step was introduced into the current waveform. This step was a region of low current during which the contact of the outgoing phase could be opened with safety.

A nearly rectangular B-H loop was shown by single crystals of some magnetic materials when magnetized along a preferred crystal axis. The most satisfactory material known was a 50–50 nickel-iron alloy in which the crystals were oriented by a cold reduction of about 95 per cent followed by a carefully controlled high temperature anneal in an atmosphere of hydrogen.

In one example the contacts had to carry over 4,000 A and required either forced air or water cooling. A life of three months' continuous service was regarded as a minimum.

Electrical erosion caused at make and break would in time change the contour of the contact faces so that a backfire occurred. To minimize contact current, arc-quench or bypass circuits were required across the contacts. The materials most resistant to contact arcing (e.g., tungsten) could not be used because of their high contact resistance. At present, silver was most widely used.

The current in the contact during the opening step was the magnetizing current of an unsaturated commutating reactor, which if supplied from a separate source would reduce the contact current accordingly. A compromise was to bias the reactor with a constant current which might reduce the contact current by 75 per cent.

Since a non-inductive resistor must be small, the currents flowing under the circuit voltage with the contact open produced ½ per cent loss of overall efficiency of the rectifier. There is no appreciable loss with a capacitor shunt, but this might resonate with the residual circuit inductance. Furthermore, the capacitor discharged through the contacts on making circuit, causing considerable burning of their faces. Both troubles were eliminated by connecting a metal rectifier in series with the capacitor to prevent its discharging through the contacts. An auxiliary bias voltage enabled the metal rectifier to operate on the flat part of its characteristic.

The rectifier contacts operated purely as isolating switches and had a maximum lift of about 0·1in, so that an arc would continue throughout the cycle, short-circuiting the a.c. and d.c. systems. The operating time of the a.c. and d.c. switchgear was too long to protect the mechanical unit, so the rectifier contacts were short-circuited until the breakers came out by a device which operated in about one millisecond from the commencement of a fault, thus limiting damage to at most two of the rectifier contacts.

The mechanical component was too sluggish to follow sudden electrical disturbances, however, and if the contacts opened elsewhere than during the low-current step a backfire was almost certain. On the other hand the length of the current-step was adequate to cover normal conditions and could be increased where exceptional disturbances were expected. The type of duty most suited to the contact rectifier was electrochemical service, where the a.c. supply and the load are steady. For this duty its efficiency was high even at low d.c. voltages.

Since the war the total capacity of contact rectifier equipments installed or on order throughout the world was believed to exceed 1 million amps.

DISCUSSION

Mr. D. E. M. Evans, who opened the discussion, referred to Mr. Dalton's paper, and pointed out that for speed matching deceleration as well as acceleration must be controlled. It was more difficult to achieve that with electronic than with Ward-Leonard control. In some processes, however, electronic control provided the only method, such as the control of position formed by the strip travelling at 2,000 to 3,000 ft/min in a steel processing plant.

Mr. J. R. Taylor, in dealing with the second paper, said it was a great help to know that the capacity in the circuit had a big effect on arc quenching, that a small capacity with resistance of the non-linear type would be successful, and that extra capacity could be added to the circuit in the form of linked capacity. One difficulty was that the contact material and the degree of polish had considerable effects.

Mr. Walters offered the criticism that Mr. Stonehouse gave no indication of the circuits he desired to quench. At the end of the paper mention was made of relay and contactor coils alone.

Mr. T. E. Houghton, referring to the third paper, said that while the contact rectifier had been developed originally in Germany, since the war much had been done in Switzerland and in the United States.

He knew of two rectifiers which were so sensitive that they came out on a voltage change of 3 or 4 per cent, but another German method with two contacts in series, one for making and one for automatic breaking, was claimed to obtain stability with a voltage change of 30 per cent. Besides efficiency, light weight and compactness were advantages of the machine.

Dr. J. C. Read said that the contact rectifier was extremely complicated, but the predictability of its operating time cycle was an advantage. He believed that the contact rectifier would be confined to the important high-power heavy-current electrochemical field particularly at lower voltages for which it was superior to any other converting plant.

Dr. T. F. Strital said that the slightest variation of current and voltage would cause the commutation step to move forward or backward. The movement of the commutation step could be followed, however, by varying the time of contact opening, or the commutation step could be widened by adopting the six-stage bridge connection.

Dr. Lynch said that the magnetic material should have been further developed in this country. By using 65/35 nickel-iron annealed in a magnetic field he had improved the material already used by a factor of approximately 5.

Belfast Plant Contracts

THE Ulster House of Commons passed the Electricity (Essential Supplies) Bill on 18th February without amendment. The Bill now goes to the Senate. The Bill empowers the chairman of the Northern Ireland Joint Electricity Committee, Sir Eyre Gordon, instead of Belfast Corporation, to place contracts for the equipment of the Victoria power station, Belfast.

Replying to the debate on the second reading, the Minister of Commerce, Lord Glentoran, in mentioning a reference to 1st May as a desirable " day of grace," commented: " I have been advised that unless the principal contracts have been placed before 1st May, so that the contractors can get on with the job, it will be impossible to have the necessary plant working in November, 1957." Earlier, the Minister had given a warning that after November, 1957, power cuts might be necessary unless the plant were working.

Mr. Holmes, a member of the Belfast Corporation Electricity Committee, in a maiden speech, said the Corporation had been told that there were only five firms capable of doing the job. Those five firms were all in a ring, but outside there were six firms of good repute equally capable of doing the work.

Mr. Henderson, in referring to the allegation that a ring existed, said he did not think a ring was a bad thing. In the development of certain intricate engineering products it was possibly correct that there should be rings, because one manufacturer was not going to take on himself the whole burden and cost of developing a new form of equipment when he had in mind that other firms were going to use his product in a modified form. Surely a manufacturer was entitled to protect himself by forming a ring?

On 1st March Belfast City Council is to consider a motion by Alderman W. Cecil M'Kee requesting the Government to hold an inquiry into the circumstances which have caused delay in placing contracts for the power station.

PARLIAMENTARY REPORT

DURING the second reading debate on the Inventions Bill in the House of Lords, Lord Mancroft, speaking for the Government, said that one of the inventions sponsored by the National Research Development Corporation was the electronic digital computer, which was more familiarly known as the "electronic brain." This astonishing machine could be used in the determination of the action of the waves on the hull of a ship, and could do the accounting of a big commercial engineering concern in five minutes—a task that would take normally something like twelve months. It was now being employed in securing an even and rapid flow of traffic in Oxford Street by instantaneously measuring and controlling all traffic for half a mile around. The Corporation's contribution to the development of these electronic brains had helped materially to strengthen the competitive position of the British firms who made them.

Another case was that of the light steam engine and boiler which had been developed by the Corporation in co-operation with Sir Harry Ricardo. This was a simple power unit, burning almost any low-grade fuel. There was also the aural microscope, which could be used by a surgeon while he was operating inside the ear and which had also been developed and sold as an instrument for determining the sex of day-old chicks. Altogether, he thought it would be agreed that the Corporation already had some solid achievements for which it could take credit.

The Bill was read a second time.

Television Service

Replying to Mr. Ness Edwards in the House of Commons, the Assistant Postmaster General, Mr. Gammans, said that the estimated population coverage of television at the present time was 35·4 million for England, 2·1 million for Wales, including Monmouthshire, and 4 million for Scotland. The corresponding licence figures were approximately 2,700,000, 107,000 and 125,000.

Shillings for Meters

Mr. Ivor Owen Thomas asked the Chancellor of the Exchequer if he was aware of a shortage of shillings in Shropshire and other Midland counties, and of the difficulties such shortage was causing to people who were dependent upon shillings for slot meter supplies of gas and electricity for domestic purposes.

Mr. Boyd-Carpenter, Financial Secretary, said he had had no specific complaint about shortages in the areas mentioned, but he was aware that early in 1953 the banks reported a general shortage of shillings and sixpences. To remedy this the Royal Mint issued to the banks between 1st January, 1953, and 5th February, 1954, 72 million shillings, and 72 million sixpences. The Mint was operating on a programme which provided for the continued issue of these denominations at the rate of 36 million coins a quarter. In sending particular quantities and denominations of coins to particular branch banks the Mint acted at the request of their head offices.

Scottish Rural Development

Commander Donaldson asked the Secretary of State for Scotland what was the proportion of electrical development in the rural areas of Scotland compared with the remainder of Britain during the financial year 1953–54.

Mr. James Stuart said he was informed that the number of farms given an electricity supply for the first time during 1953 was 2,239 in Scotland, and 11,172 in England and Wales. These figures were 6·4 per cent and 4·2 per cent of the total number of farms in Scotland and in England and Wales respectively. In addition, 2,107 crofts in the North of Scotland District were connected to a supply during 1953.

Coal Comparisons

Mr. Hastings asked the Minister of Fuel and Power how much coal was allocated to electricity generating stations and gasworks within the London postal area during the last year for which records were available; and how these figures compared with those of pre-war years.

Mr. Geoffrey Lloyd said that the precise figures asked for were not available, but generating stations and gasworks in the London Civil Defence Region consumed about 8·1 and 7·7 million tons of coal respectively in 1953 and about 4·5 and 6·2 million tons respectively in 1938.

Australian Import Control

Last week Mr. Menzies, the Australian Prime Minister, announced his Government's intention to relax import controls further on 1st April. The effect would be to permit the entry of goods to a further value of over £A25 million a year. Practically all essential goods would be freed from quantitative restriction while the quota for less essential imports would be increased from 50 to 60 per cent of the 1950–51 level.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 3rd March:—

SPARCONOMIC. No. 723,223, Class 7. Electric alternators, generators, erosion machines, disintegrators, machine tools and tools for use therein, and parts. No. 723,224, Class 9. Scientific and electrical apparatus, instruments and parts.—Sparcatron, Ltd., Abbey Yard, Bath.

MARCONI. No. 702,309, Class 9. Radio, telephonic, telegraphic and television transmitting and receiving apparatus, etc., but not including any goods for public broadcast reception or public address. — Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, London, W.C.2.

DRALOWID. No. 720,430, Class 9. Electric resistances, potentiometers, condensers and holders therefor, microphones, transmitters, chokes, voltmeters and ammeters, etc. —Steatit-Magnesia Akt.-Ges. Lauf-Pegnitz, Germany. Address for service, c/o Gill, Jennings & Every, 51–52, Chancery Lane, London, W.C.2.

TELLALOUD. No. B719,970, Class 9. Loudspeaking telephonic apparatus, instruments and parts.—Winston Electronics, Ltd., 1, Park Road, Hampton Hill, Hampton, Middx.

CAPTAIN VIDEO. No. 716,948, Class 9. Radio and television apparatus, instruments and parts.—Allen B. Dumont Laboratories, Inc., Clifton, N.J., U.S.A. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

PLATINOHMIC. No. 718,400, Class 9. Electric resistors.—Painton & Co., Ltd., Bembridge Drive, Kingsthorpe, Northampton.

TALBE. No. B722,356, Class 9. Radio apparatus for use in connection with aircraft navigation and control.—Burndept, Ltd., 681, Salisbury House, Finsbury Circus and London Wall, London, E.C.2.

ORTHOTRON. No. 723,883, Class 9. Scientific and electrical apparatus and instruments, parts and fittings but not any goods of the same description as lenses. TENSIVICK. No. 725,141. METROMATIC. No. 725,146, Class 9. Electric arc welding apparatus, electric welding electrodes and holders.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1–3, St. Paul's Churchyard, London, E.C.4.

PLASTER MASTER. No. 724,167, Class 9. Electrical apparatus included in Class 9.—S. O. Bowker, Ltd., 19–21, Warstone Lane, Birmingham, 18.

SPERRY. No. B724,533, Class 9. Scientific, nautical and electrical apparatus, instruments and parts.—Sperry Corporation, Long Island, New York, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5–9, Quality Court, Chancery Lane, London, W.C.2.

FAGAS. No. 725,053, Class 9. Radio receiving apparatus and parts.—Basford (Exporters) Co., Ltd., Broad Street Buildings, Liverpool Street, London, E.C.2.

PERIBRAID. No. 723,360, Class 17. Electrical insulating sleeving in the form of braid. —Suflex, Ltd., 35, Baker Street, London, W.1.

DURAGLAS. No. 725,025, Class 17. Heat, sound and electrical insulating materials made wholly or principally of glass.—Turner Brothers Asbestos Co., Ltd., Asbestos House, 77–79, Fountain Street, Manchester, 2.

INDUSTRIAL NEWS

N.F.E.A.—A.S.E.E. Agreement Ending

AT a meeting between representatives of the National Federated Electrical Association and the Association of Supervising Electrical Engineers in February, 1952, the A.S.E.E. asked for a 20 per cent increase in basic salaries and cost-of-living allowances for its members under the agreement existing between the two associations. In May of the same year the N.F.E.A. offered a 10 per cent increase in basic salaries and the consolidation of the cost-of-living allowance in those salaries provided that supervising electrical engineers were withdrawn from the agreement. Although at first the A.S.E.E. would not agree to this, in January, 1953, the A.S.E.E. Council expressed its willingness to negotiate for staff foremen (supervising) and staff foremen only. In June, 1953, the N.F.E.A. notified its agreement to grant a 10 per cent increase to these grades but not to back-date it to June, 1952, as suggested; it proposed dating it from 1st September, 1953.

Unable to secure a meeting with the N.F.E.A., the A.S.E.E. requested reference of the matter to arbitration but in September last was informed that the N.F.E.A. considered that the agreement should be terminated. Later attempts to arrange a meeting proved abortive and the agreement will end on 28th February.

The N.F.E.A. says that its members feel that such an agreement is unnecessary but this view is not shared by the A.S.E.E. which thinks that the continuation of the agreement or the introduction of a new one is essential for the maintenance of harmony between electrical contractors and their supervisory staffs.

Electric Locomotive Trials

The first of seven double bogie, six axle electric locomotives of the Co-Co formation for the Manchester–Sheffield electrification scheme is now undergoing trials. The mechanical parts have been built at the Gorton Works and the electrical equipment has been supplied by the Metropolitan-Vickers Electrical Co., Ltd. While of the mixed traffic type, the locomotives are primarily intended for passenger working. They are provided with an electric boiler for train heating and are capable of a maximum speed of 90 m.p.h.

Power Station Worker Dismissed

In order to prevent a stoppage of work at North Tees power station, brought about by a union domestic dispute, the British Electricity Authority has dismissed Mr. Leslie Huntley, a 32 years old engineer. Mr. Huntley was formerly employed at William Gray & Co.'s shipyard and last December came into conflict with his union, the A.E.U., when he refused to take part in the one-day national strike in support of a wages claim. Subsequently he obtained work at North Tees power station. When his identity was discovered by union shop stewards the B.E.A. was informed that unless he was discharged there would be a strike. Mr. Huntley sought an interview with the A.E.U. District Committee, but the Committee refused to meet him on the grounds that he was no longer a member of the union.

It is reported that Mr. Huntley intends to apply to the High Court for an injunction restraining the Committee from preventing his employment by putting pressure on employers.

Electrical Contracting Dispute

Up to the time of our going to press there was no news of any move to settle the wages dispute between the National Federated Electrical Association and the Electrical Trades Union. About 2,000 members of the Union were on strike this week, which is the seventh week of the dispute. On Monday last the Union called out the men employed by Barlow & Young, Ltd., of which company the president of the Electrical Contractors' Association, Mr. S. L. M. Barlow, is managing director. Electricians at a number of important establishments, including atomic research stations, airfields, power stations and oil refineries, have remained on strike during the week.

Television Transmitting Stations

The B.B.C. has announced that contracts for the provision and erection of the masts for the transmitting aerials at the permanent medium-power television stations at Rowridge (Isle of Wight), Pontop Pike (near Newcastle-upon-Tyne), and North Hessary Tor (South Devon) have been placed with British Insulated Callender's Construction Co., Ltd. Similar contracts for the provision and erection of masts for the permanent medium-power television stations at Divis (Northern Ireland) and Core Hill (near Aberdeen) have been placed with the J. L. Eve Construction Co., Ltd. All the masts will be 500ft high, except that for North Hessary Tor, which will be 750ft.

The contract for the first stage of the building work at the new London television transmitting station at the Crystal Palace has been placed with Higgs & Hill, Ltd.

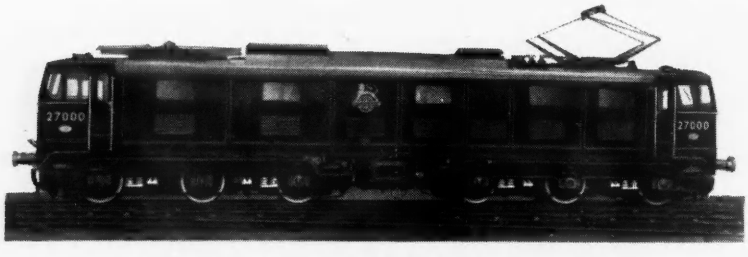
Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £235 0s 0d
Fire Refined 99·70%	ton £234 0s 0d
Fire Refined 99·50%	ton £233 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £292 10s 0d
H.C. wire and strip	ton £265 10s 0d
LEAD, English ..	ton £82 10s 0d
Foreign	ton £81 0s 0d
MERCURY	flask £64 10s 0d
TIN, block (English) ..	ton £667 0s 0d
ZINC, G.O.B. Foreign	ton £71 0s 0d
Electrolytic	ton £78 0s 0d
BRASS Tubes (solid drawn)	lb 1s 10⅜d
Sheet	ton £237 15s 0d
Wire	lb 2s 5½d
PHOSPHOR BRONZE Wire	lb 3s 8⅜d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 16⅜d–16½d

Transformer Drying Oven

The Metropolitan-Vickers Electrical Co., Ltd., referring to the article entitled "Transformer Drying Oven" in last week's issue, asks us to inform readers that the oven shown is much larger than that described in the text and that it is actually installed in the Transformer Department of the Trafford Park Works of Metropolitan-Vickers, and not as stated at the Brush Works, Loughborough.



One of the electric locomotives for the Manchester–Sheffield line

Asea Irish Company

The Asea Electric, Ltd., London, has announced the formation of a new company to take over its interests, and those of the Asea group, in the Republic of Ireland. This company, Asea Electric (Ireland), Ltd., will commence operations at 4, Mount Street Crescent, Dublin, on 1st March and the managing director will be Mr. J. A. V. McEvoy, B.E., who was formerly with the Electricity Supply Board in Eire. From April, 1922, to the date of his death in October, 1951, Asea Electric, Ltd., were represented in Ireland by the late Mr. E. C. Handcock, M.I.E.E., and, thereafter, by E. C. Handcock, Ltd., of Handcock House, Fleet Street, Dublin. The agreement with this latter concern is being terminated by mutual consent as from 28th February, as the growing volume of business in the Republic, and the amount of plant already installed there by the Asea group, now warrants a separate organization in the territory under the direct control of the principals.

Instrument Makers' Dinner

The eighth annual dinner and dance of the Scientific Instrument Manufacturers' Association will be held at the Savoy Hotel, London, on 2nd April next. The principal guests will be Sir John and Lady Cockcroft.

East Pakistan Jute Mills

Large quantities of jute are now being processed at the Adamjee Mills, Narayangani, East Bengal. These three mills are the largest of their kind in the world and when completed they will process the whole of the country's domestic jute production and also be able to export a considerable quantity of jute goods.

To provide power for the mills the Government of East Pakistan proposes to build a 40 MW steam generating station; in the meantime a nearby cotton mill and diesel generators on the Adamjee site are supplying the power.

To minimize the consumption of electricity, which is expensive in East Pakistan, fluorescent lighting is used throughout the mill. The interior lighting is provided by B.T.H. fluorescent fittings and the outside lighting by Ediswan sodium fittings. Each mill has an area of about 500,000 sq ft and each is illuminated by 2,200 5ft 80 W fluorescent tubes. The fittings are attached to steel ducting supplied by Channel Conduits, Ltd., which is supported by galvanized steel catenary wires from the steelwork of the roof. It carries all the lighting wiring and has resulted in exceptionally low installation costs. The method of installation was worked out by Mr. H. M. Nimmo, who was then chief electrical engineer to the Adamjee Mills, in conjunction with A.E.I. (Pakistan) and B.T.H.

All the cables for the mill were supplied by the Edison Swan Electric Co., Ltd., paper insulated cable being used throughout. Three 1,750 MVA Metro-Vick transformers are installed in each mill, while the spinning frame motors, which have a total of about 7,765 h.p., were supplied by A.E.I. companies. There are some 400 Metro-Vick and over 90 B.T.H. motors.

The radio, sound equipment and communications workshop in the new G.E.C. premises in Singapore

G.E.C. in Singapore

The General Electric Co., Ltd., which has been represented in Malaya for nearly fifty years, has recently opened new premises in Singapore which will give South East Asia improved service over the whole range of the company's products.

The new Magnet House, with modern showrooms, stores and offices in addition to servicing workshops, is situated in Bukit Timah, Singapore, 10. It has two storeys and provides more than 80,000 sq ft of floor space. It was officially opened at the end of January by Mr. Leslie Gamage, M.C., vice-chairman and joint managing director of the G.E.C., who is at present on a six weeks' tour of the company's branches in South East Asia.

The main building is divided to provide a light and airy workshop to house a service organization for the company's radio, sound equipment, radio communication and telephone business. A second workshop is provided for refrigerators and general work. The refrigerator section inspects all new refrigerators for possible damage in shipment and gives them a test run before releasing them for distribution. Facilities are also provided for overhauling refrigerators and other domestic appliances and for testing and repairing meters. In the general workshop section provision is made for machining and fabrication. A test bay will shortly be installed for testing diesel engines, alternators, motors and ventilation equipment under full load. The industrial showroom is air-conditioned and lighted by indirect cornice lighting.

B.T.H. fluorescent fittings in the loom section of Adamjee No. 1 Mill

Blue Book

The 1954 edition of the Electrical Trades Directory—the *Electrical Journal* "Blue Book"—retains all the features of last year's edition. Its thirteen sections, covering the various branches of the electrical industry, personalities and products have been considerably enlarged, and the directory now contains over 61,000 references. Details are given of approximately 13,000 concerns, and in the "Products and Materials" section there are 40,000 references under 2,100 headings.

The "Trade Names" section now contains more than 5,000 names.

There are also included in the directory details relating to the British Electricity Authority with its Generation Divisions and the Area Electricity Boards, as well as the names of the members and chief officials; Government Departments and Research Establishments; the Coal Board chief and divisional engineers; British Railways and London Transport; the Institution of Electrical Engineers and other professional and trade organizations associated with the industry.

The directory is published by Benn Brothers, Ltd., Bouverie House, Fleet Street, London, E.C.4, at £2 10s, including carriage.

Cheaper Metering

In a letter to *The Times* this week, Prof. G. H. Rawcliffe (Bristol University) questioned the need for extreme precision in the metering of domestic electricity. He advocated a "utility" domestic meter, stable over a long period but not otherwise unduly accurate or refined, and considered that the whole procedure for testing and certification should be drastically simplified.

Evasion of Purchase Tax

At Glasgow Sheriff Court on Monday Charles Edelman, principal of a Glasgow firm described as wholesale electrical engineers, A. & C. Edelman (1939), Ltd., was sentenced to three months' imprisonment for evading the payment of purchase tax amounting to £1,513. The company itself was fined £1,500 and the sales manager, W. McCormack, £25 (or 60 days' imprisonment).

Falk Lighting Fittings

Falk, Stadelmann & Co., Ltd., who have recently issued a catalogue (No. 800) of a completely new range of contemporary lighting fittings designed by Mr. J. M. Barnicot, M.S.I.A., have had showrooms specially prepared at their Manchester, Leeds, Newcastle and Cardiff Branches to display these fittings, and invite electrical engineers, consultants and others interested to visit the showrooms where technical staff is available to discuss electrical and lighting problems. A view of the Manchester showrooms is shown in the accompanying picture.

New contemporary lighting fittings showrooms at the Manchester Branch of Falk, Stadelmann & Co., Ltd.

Safety in Ironfoundries

The Council of Ironfoundry Associations, Crusader House, 14, Pall Mall, London, S.W.1, has set up a special committee to co-ordinate and intensify the efforts being made throughout the industry at the present time to keep down its accident rate in ironfoundries. Many of the risks are common to other industries such as those associated with the handling and transportation of large quantities of materials. A number of special risks arising from the use of hot metal increase the complexity of the problem.

E.A.W. Certificate Examinations

The E.A.W. certificate examinations in electrical housecraft are held twice yearly. At the December examination thirty-three teachers and sixty-eight demonstrators gained the certificate. To date altogether 1,850 teachers and 2,074 demonstrators hold the certificate.

The E.A.W. diploma awarded to certificate holders of experience who pass a practical test was recently gained by Miss M. H. Jones of the North Western Electricity Board, Macclesfield; and by Miss J. F. Ollis of the Eastern Electricity Board, Welwyn Garden City. To date 462 demonstrators and ninety-one teachers hold this diploma.

Electrical Safety Course

An Electrical Safety Course is to be held at Burton Manor Residential College from 21st to 27th March. In addition to the usual lectures on various problems of electrical safety, such as static electricity, protective systems, the legal aspect of safety, earthing, training of technicians, and planning and supervision of work on dangerous and live equipment, a special feature will be made on 24th March of the effects of electricity on human beings and treatment of those effects. Among the lecturers will be Prof. S. Jellinek, Prof. Djourno, Dr. R. Frohlicher, Dr. Francois, Dr. Hall Ratcliffe and Dr. Fletcher. Among those already having notified their intention of attending the course are the chief engineer of the Swiss Inspectorate of Power Installations and representatives of the Inspectorates of Holland, Denmark and France. There will also be a number of other foreign engineers. The course is organized by the Burton Manor College for Adult Education and the Ministry of Labour and National Service. The fee for the course is £10 including tuition and full board. For the one-day course, medical officers are invited, the fee being £1 10s including lunch and tea.

Japanese Investments in India

A survey of foreign investments in India during 1952–53 appearing in *Indian Trade and Industry* includes particulars of two Japanese-sponsored concerns. One, Kamani Metals and Alloys, manufacturers of paper-insulated cables and a.c.s.r. conductors, has a total capital of Rs. 65 lakhs (£487,500) of which Rs. 13·5 lakhs (£101,250) has been provided from Japan. Jaipur Metal Industries, Ltd., has a capital of Rs. 20 lakhs (£150,000) of which Rs. 1·5 lakhs (£11,250) comes from Japan; it produces domestic electricity meters.

Tyneside Productivity

Mr. R. W. Mann, chairman of the Tyneside Productivity Committee, has announced that only 50 of the 500 local firms approached have agreed to take part in the scheme for inter-factory visits to help stimulate production; 350 have not replied at all. Urging the firms not taking part to reconsider the matter, Mr. Mann says it is difficult to make a proper approach to workmen on the need for higher productivity when the managements themselves refuse to co-operate.

Swiss Electrical Industry

A further decline in orders was experienced by the Swiss electrical equipment industry during the first part of the year just ended, but an improvement subsequently occurred with the result that employment in this important section of Switzerland's industry was maintained at a relatively high level. Because of the considerable increase in the productive capacity of foreign competitors, Swiss makers have had to overcome much stiffer competition, not merely affecting prices, but leading to customers demanding excessively long terms for payment, especially for large-scale projects.

The continued high level of production is mirrored in satisfactory export figures: in fact, the volume of exports for the first ten months of last year was 3·8 per cent higher than during the corresponding period of 1952, exceeding even the figure for the boom year 1951 by 2 per cent. However, the value of exports at roundly 234 million fr. was somewhat lower than in 1952. A marked decline (8·5 per cent) in the export value was registered in respect of electric motors and transformers and a decline took place also in foreign sales of control equipment. On the other hand, exports

of small electrical equipment showed an increase. With the exception of certain special types of tinplate, the supply of raw materials and semi-manufactured products presented no problem. On the whole, the Swiss electrical equipment industry is looking to the future with confidence strengthened by the fact that orders in hand will ensure the maintenance of a high level of employment for the next eight to twelve months.

Ipswich "Forum"

An "open forum" followed the February meeting of the Ipswich & District Electrical Association at Electric House, Ipswich. The "panel" consisted of Mr. H. E. Wright (Ipswich) representing the electrical contractors, Mr. W. Gilbert (Ipswich), member of the Eastern Electricity Consultative Council, representing industrial consumers, Mr. R. W. C. Stebbings (Bury St. Edmunds) representing the supply authority, and Mr. S. L. Crafford (Colchester) representing manufacturers of electrical equipment. Mr. G. H. Blackburn, chairman of the Association, acted as question master. A very wide field was covered by the questions discussed.

E.W.F. Dinner

At the annual dinner of the Electrical Wholesalers' Federation on 18th March the principal guest will be Mr. W. J. Brown, former M.P. for Rugby.

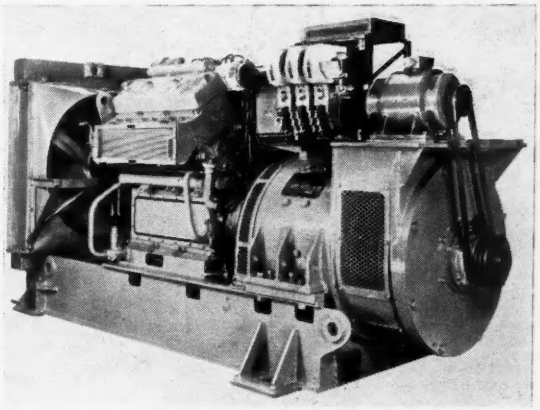
Canadian Catering Equipment Order

A Canadian order for British food and catering equipment worth £20,000 has been placed with Crypto, Ltd. Within the next two months a complete range of Crypto products will be shipped to the British General Electric Co. (Canada), Ltd., which in future will act as Crypto's sole Canadian agent. A full display of this equipment will be on show at the Canadian International Trade Fair in Toronto from 31st May to 11th June.

Diesel-Electric Locomotives

In 1951 two four-wheeled diesel-electric locomotives were built by the Yorkshire Engine Co., Ltd., in collaboration with the British Thomson-Houston Co., Ltd., and these have now been in intensive service in a large steel works for over three years. The company is now making two types of standard diesel-electric shunting locomotives for heavy industrial requirements in this country. The four-wheeled type has an installed rating of 275 h.p., while the six-wheeled model is rated at 400 h.p. Both have diesel engines of Davey Paxman manufacture and have similar electrical equipment and control gear designed and made by B.T.H.

The 275 h.p. locomotive is of the rigid frame type with four 3ft 6in diameter wheels coupled, while the 400 h.p. locomotive has six 3ft 8in diameter wheels coupled. The former incorporates two axle hung traction motors, each with its 22·85 : 1 reduction gear box, and the latter has traction motors hung on the leading and trailing axles only, each with a 19·75 : 1 reduction gear box. The weight of the locomotives is 37/45 tons and 48/50 tons respectively. The maximum tractive efforts are 26,000 lb and 30,000 lb, while the corresponding tractive efforts at continuous rating are 12,500 lb and 10,700 lb. The speeds of the two locomotives at continuous rating are 6·3 and 10 m.p.h. respectively.



Power unit for 275 and 400 h.p. diesel-electric shunting locomotives

Arts and Crafts Exhibition

As the outcome of sixty-one local exhibitions organized by the Area Boards and Divisions of the British Electricity Authority a national arts and crafts exhibition is until to-morrow (Saturday) being held at the Old Horticultural Hall, Westminster. It is the second such exhibition arranged by the National Joint Advisory Council of the Electricity Supply Industry. In performing the official opening last Friday, Lord Citrine, chairman of the B.E.A., who is also chairman of the National Joint Advisory Council, said he thought that the twelve thousand exhibits, nearly all of them made during the past three years, shown at the local exhibitions, clearly indicated the widespread interest in creative leisure-time activity. The standard of performance had been very high and the judges must have had difficulty in selecting the winning exhibits.

The entries included oil and water colour paintings; drawings, etchings and engravings; photographs; illustrations and illuminations; sculpture and modelling; pottery; literature; wood carving; furniture making; basketwork; models; metalwork; toys; leatherwork; needlework; dressmaking; knitting; weaving; rug making; and musical instrument making. There were special sections for work by apprentices and children of those engaged in the industry. On Saturday afternoon a programme of music was presented by the London Electricity Sports and Social Association.

Urgent Repairs for Africa

Collins Electrical, Ltd., electrical repair specialists, of London, were recently called upon to perform an urgent job from the Middle East. Two rotors from 45 kW, 55 kVA, 220/240 V, 3-phase, 4-wire, 50 c/s alternators were sent by air for immediate rewinding and correction. Instructions were given for their being flown back as soon as the necessary repairs had been completed. The rotors arrived at the Collins' workshops in the middle of January and were ready for the return flight within four weeks.

Tungsten Ore Price Reduction

The Ministry of Materials has announced that from 22nd February its selling price for tungsten ores of standard 65 per cent grade and ordinary quality has been reduced as follows:—Wolframite from 145s to 120s; Scheelite from 140s to 115s per long ton unit delivered consumers' works.

Trade Announcements

Elga Products, Ltd., have appointed A. Hurst & Co., Kirkman House, 54a, Tottenham Court Road, London, W.1, to act as sole export managers for their "Auto-Perc" coffee maker and "Conquest" kettle.

On Monday **Honeywell-Brown, Ltd.,** are opening a new office at 35, Byrom Street, Manchester, 3. Under the supervision of Mr. Tom Jackman, it will deal with inquiries from Cumberland, Westmorland, Lancashire, Cheshire and North Wales.

Teddington Industrial Equipment, Ltd., has opened Midland area offices at 107, Dale End, Birmingham (telephone: Central 4791/2). Mr. V. C. Miles will be in charge.

Catalogues and Lists

Carter & Co. (Nelson), Ltd., Nelson, Lancs.—Illustrated leaflet dealing with the company's new type "M" siren.

Fraser, Dunn & Co., Ltd., 1, Imperial Buildings, Addiscombe Road, East Croydon, Surrey.—Illustrated leaflet describing the "Schlegel" system of waste oil refining plant.

Precision Components (Barnet), Ltd., 13, Byng Road, Barnet, Herts.—Illustrated priced folder on "Kabi" terminal blocks and 12-way terminal strips.

Troughton & Young (Lighting), Ltd., 143, Knightsbridge, London, S.W.1.—Illustrated priced folder on additions to the "Mondolite" range of lighting fittings.

Radio Interference Suppression

IN spite of publicity by the Post Office, the B.B.C. and other organizations, the response of the motoring public to requests for voluntary radio interference suppression has been disappointing. This, it is thought, may be due to several reasons, such as the feeling that suppression should be carried out in television receivers, the lack of knowledge of what to do, or apprehension concerning the effect of suppression components on the performance or vehicles.

The Institution of Electrical Engineers has therefore issued a leaflet giving guidance on these points. Dealing with the points in order, it says it should first be realized that complete elimination of interference solely by measures taken at the receiver is impossible. A useful degree of interference suppression is now incorporated in virtually all television sets on the market. The use of a special aerial may give further but limited relief.

For the motorist there is no difficulty. Ignition suppressors (or resistors), made to comply with a stringent British Standard, are readily available from garages and service stations and can be fitted to the ignition distributor of an engine in a matter of minutes, at little cost. The interference will be reduced by one such suppressor to a more tolerable value, and there is an even chance that it will be reduced sufficiently to comply with the limit to which manufacturers are now working. A much higher degree of suppression and almost certain compliance with the limit will be attained if suppressors are fitted at the sparking-plugs also.

Carefully controlled tests have shown that fears of adverse effects on engine performance are groundless for normal engines under ordinary operating conditions. Suppressors reduce the brilliance of the ignition spark, but the appearance of the spark is no criterion of its ignition properties. If, after a suppressor complying with the British Standard has been fitted, ill-effects are nevertheless met with, this is a strong indication that something is amiss, and the carburation and ignition systems should be examined, since early failure of such a suppressor is highly unlikely. In the cases that have been investigated it has been found that the trouble was due basically to some such feature as incorrect carburettor adjustment or an ignition system already on the point of failure. The insertion of suppressors merely brought the defects into earlier prominence. Suppressors actually reduce considerably the wear of sparking-plug electrodes, thus increasing plug life and reducing the need for adjustment.

It is hoped that those motorists who have not so far taken action will be reassured by this information and as a matter of goodwill will have their vehicles " suppressed " at the earliest opportunity and encourage others to do the same.

Relevant British Standards

The British Standards Institution, 2, Park Street, London, W.1, has recently published two standards on the subject of radio interference, price 4s each.

B.S. 727 : 1954, " Characteristics and performance of apparatus for measurement of radio interference," has been revised and the equipment described is now suitable for the measurement of radio noise in the frequency range of 150 kc/s to 150 Mc/s. A more detailed specification of the performance of noise measuring equipment replaces the somewhat loose specification, and the example of a suitable measuring set, given in the 1937 edition. The apparatus specified is intended for the measurement of radio frequency noise field strength or terminal voltages. The specified bandwidth and time constants of the relevant sections of the receiver, and the characteristics of the indicating instrument, are such that the readings obtained are a measure of the annoyance effect of the interference. Radio noise voltages and fields are measured in equivalent r.m.s. microvolts and microvolts per metre, respectively, i.e., the measuring set is calibrated in terms of the r.m.s. value of a sine wave voltage and the indicated voltage of any given noise voltage is therefore the r.m.s. value of a sine wave voltage which would give the same indication. It is emphasized that the indications are not the r.m.s. value of noise voltages. The wide frequency range specified cannot be covered without changing some of the characteristics of the measuring equipment. The change has been made at a frequency of 30 Mc/s, and certain clauses therefore specify different characteristics for the frequency ranges of 150 kc/s–30 Mc/s and 30 Mc/s–150 Mc/s.

B.S. 800, " Limits of radio interference," has been revised and extended to cover the existing television frequency band of 40 Mc/s to 70 Mc/s. The standard specifies the limits of magnitude of radio noise terminal voltages and radio noise fields throughout the ranges 200 kc/s to 1,605 kc/s and 40 Mc/s to 70 Mc/s. Different limits are prescribed for these two ranges. The limits apply to equipment directly connected to distribution systems having a declared voltage between conductors of not greater than 500 V, or a terminal voltage between any one conductor and earth not greater than 250 V. The limits for radio noise fields also apply to electrical equipment which is entirely self-contained, except motor vehicles and i.c. engines, electrical equipment in ships, traction systems and equipment for the generation and application of radio-frequency energy.

The limits are regarded as a reasonable compromise between the interests of users of radio frequency telecommunication services in these bands and are expected to protect the majority of receivers from interference when receiving programmes from appropriate transmitters in the United Kingdom. The prescription of limits low enough to give such protection to all broadcast services including that in areas of low field strength, is at present considered impracticable for economic and manufacturing reasons.

For similar reasons, in particular the cost of adequate testing, it is at present considered impracticable to prescribe, as a condition of compliance with the present standard, limits for the whole of the frequency range from 200 kc/s to 100 Mc/s or higher. Certain of the frequencies, which are at present excluded from this standard, are used for services concerned with the safety of life, and others are used for broadcasting and other essential services. Measures taken to suppress interference over the frequency ranges covered by this standard will offer some protection at other frequencies, and it is highly desirable that such measures should, as far as is practicable, be so designed that the limits prescribed for the range 200 kc/s to 1,605 kc/s are not exceeded over the wider range of 200 kc/s to 30 Mc/s and that the limits prescribed for the range 40 to 70 Mc/s are not exceeded over the range 30 Mc/s to at least 100 Mc/s.

Studio Spotlights

At the request of the British Film Producers' Association a British Standard (B.S. 2063: 1953), price 2s 6d, has been prepared relating to studio spotlights. It deals with three sizes of spotlights using, respectively, 500 W, 2 kW and 5 kW filament lamps.

It was originally felt that it might be practicable to prepare a standard which dealt not only with the general dimensions and construction of spotlights, but which also specified quantitatively their optical performance. Comprehensive optical performance tests were carried out on commercial spotlights and, while the results of this research were of considerable interest, it was seen that optical performance tests were of such a nature that they could be done only under the closely controlled conditions of a research laboratory, and that even under such conditions the variation likely to be obtained in the results would be considerable. For these reasons it was finally considered that the desired practical aim of establishing a reasonable uniformity in the performance of spotlights could be as well achieved by a control of the essential dimensions of the optical system as by any attempted photometric standard.

GENERATION AND DEVELOPMENT

Amalgamation of B.E.A. Divisions

THE British Electricity Authority has decided to amalgamate the North Western and the Merseyside and North Wales Generation Divisions as an experiment in order to obtain experience in the working of a larger unit than the existing Divisions. The amalgamated Division will progressively be given increased responsibility for its operations in pursuance of the Authority's declared policy of decentralization.

The enlarged operating unit will be known as the " North West, Merseyside and North Wales Division " and will be inaugurated on 1st April, 1954. The Authority emphasizes that the changes which must inevitably take place will be developed gradually and in such a way as to cause the minimum of hardship or disturbance to the employees concerned; their salaries and wages will not be adversely affected.

Mr. A. R. Cooper, controller of the North Western Division, and Mr. P. Briggs, controller of the Merseyside and North Wales Division, have respectively been nominated divisional controller and deputy controller of the amalgamated Division.

Electricity Boards' Sales

The accompanying table analyses the sales of Electricity Boards for January last. The national figures show an increase over January, 1953, of 7·5 per cent, but when corrected for weather and the number of effective working days, the increase is 8 per cent. The weather conditions were slightly colder and there were less effective working days than in January, 1953.

Carlisle Agreement

Carlisle City Council has reached agreement with the British Electricity Authority concerning money held by the Corporation in respect of its electricity undertaking at the time of nationalization, as a result of which the Corporation will receive £168,567. When the transfer of the electricity undertaking took place difficulties arose about the disposal of money placed in the suspense account. A writ originally issued against the Corporation by the B.E.A. was withdrawn.

Protest Against Tariffs

Halifax Chamber of Trade has decided to lodge its objections against the Yorkshire Electricity Board's new commercial and industrial tariffs with the local M.P. (Mr. Dryden Brook) and with Mr. Geoffrey Hirst, M.P. for Shipley.

Portsmouth Generating Station

The extensions to Portsmouth generating station, which are now nearing completion, comprise one 30 MW B.T.H. turbo-alternator, two Mitchell boilers of 185,000 lb/hr evaporative capacity, and a Metropolitan-Vickers " Unified " boiler control system. As part of the tidying up process and to commemorate the Coronation, it has been decided to plant a number of trees in the grounds, which are to be laid out in the form of gardens. The planting ceremony was performed on Monday last, 22nd February, by Dame Caroline Haslett, and on the same day the Lord Mayor of Portsmouth, Councillor Frank Miles, J.P., unveiled a plaque in the station over the site where once stood the home and workshop of John Pounds, founder of the Ragged Schools.

Gibraltar Changeover Completed

We learn from Mr. H. A. Matthey, sales and development engineer, Gibraltar Electricity Department, that the scheme for changing over the supply in the city from 110 V, 76 c/s to 240 V, 50 c/s (*Electrical Review*, 12th May, 1950, page 960) has now been completed. The 2 kV system has been replaced by a network of three 6·6 kV ring mains with radial feeders. Diesel engines have also taken the place of the old steam generating plant. Mr. Matthey adds that the load has grown so rapidly that an additional set will have to be installed as soon as possible.

The changeover scheme was designed by the city electrical engineer, Mr. E. V. Andlaw, M.B.E., A.M.I.E.E., A.M.I.Mech.E., and Messrs. Preece, Cardew & Rider, consulting engineers to the Crown Agents for the Colonies.

Portuguese Colonial Development

A copy of a six-year development plan covering Angola, Mozambique and Portuguese India may be seen on application to the Board of Trade Commercial Relations and Export Dept., Room 4346, Horse Guards Avenue, London, S.W.1 (Ref. C.R.E. 3930/53. Gen/1126). Extraordinary expenditure includes 120 million escudos for hydro-electric development at Mabubas, Biopio and Matala in Angola; 70 million escudos for the first part of hydro-electric development of the Movene and 20 million escudos for a power line from Revue to Beira in Mozambique; and various railway schemes.

Cost of St. Lawrence Project

Mr. Robert Saunders, chairman of the Ontario Hydro-Electric Power Commission, stated recently that the Commission's share of the cost of the power section of the St. Lawrence seaway project would be $300 million. This was $75 million more than previous estimates, he said.

French Speed Record

A three-day trial of the C.C.7121 electric locomotive of the French National Railways took place last week on the track between Dijon and Beaune. It culminated in the locomotive's reaching the speed of 150 m.p.h., claimed to be a record. This locomotive was built for mixed traffic in 1949 for use on the Paris–Lyons main line.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for January (million kWh)			Twelve Months Totals Ended 31st January (million kWh)		
	1953	1954	Inc. or Dec. %	1953	1954	Inc. or Dec. %
London	639·3	665·2	+ 4·1	5,487·3	5,630·3	+ 2·6
South Eastern	357·9	389·1	+ 8·7	3,167·0	3,343·4	+ 5·6
Southern	415·3	442·5	+ 6·5	3,688·6	3,925·6	+ 6·4
South Western	195·8	212·3	+ 8·4	1,773·4	1,909·8	+ 7·7
Eastern	575·0	613·0	+ 6·6	5,145·3	5,425·0	+ 5·4
East Midlands*	474·8	500·6	+ 5·4	4,388·9	4,638·6	+ 5·7
Midlands*	629·8	685·8	+ 8·9	5,962·5	6,206·2	+ 4·1
South Wales*	312·8	350·0	+ 11·9	3,281·3	3,509·6	+ 7·0
Merseyside and North Wales*	336·6	367·3	+ 9·1	3,366·9	3,481·5	+ 3·4
Yorkshire*	594·5	631·7	+ 6·3	5,780·9	6,054·6	+ 4·7
North Eastern*	340·6	361·0	+ 6·0	3,502·1	3,638·0	+ 3·9
North Western*	656·8	713·4	+ 8·6	6,343·7	6,784·8	+ 7·0
South-East Scotland	127·6	138·7	+ 8·7	1,232·2	1,302·4	+ 5·7
South-West Scotland*	306·4	328·8	+ 7·3	2,972·6	3,125·0	+ 5·1
Total all Area Boards	5,963·2	6,399·4	+ 7·3	56,092·7	58,974·8	+ 5·1
Direct Supplies by Central Authority	75·1	93·9	+ 25·0	743·8	980·3	+ 31·8
Grand Total	6,038·3	6,493·3	+ 7·5	56,836·5	59,955·1	+ 5·5
Mainly Industrial Areas*	3,652·3	3,938·6	+ 7·8	35,598·9	37,438·3	+ 5·2
Mainly Non-Industrial Areas	2,310·9	2,460·8	+ 6·5	20,493·8	21,536·5	+ 5·1
Total Number of Effective Working Days	28·41	28·14				

* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year.

Financial Section

STOCKS and SHARES

IN the industrial markets of the Stock Exchange prices hold their ground fairly well. At the same time, they have failed to recapture anything approaching the strength and activity which, in the early part of this month, had looked likely to carry prices well above the previous high records. Since the halt, the volume of business has fallen to a lower ebb, leaving the impression that investors are investigating more thoroughly the soundness of the basis for the previous rise before committing themselves further. Some of them have evidently decided to take profits and stand aside for the present. Company dividend news has not always come up to expectations, and in more than one instance there has been a reminder that the sequel to a capital bonus is by no means invariably an improvement in the dividend. Two main events of the week were the English Electric dividend statement and the announcement of I.C.I.'s capital proposals. The latter, calling for £30 million new money, had the effect of lowering British Government and national board issues to the tune of $\frac{1}{8}$ to $\frac{1}{4}$ all round.

English Electric Dividend

The electrical equipment market registered at first some disappointment over English Electric's proposal of a $6\frac{2}{3}$ per cent final dividend, which is in effect at the same rate as last year's 10 per cent payment, allowing for the intervening 50 per cent share bonus. Following the announcement the price of the shares was marked down in the market from 42s 6d to 40s 6d, although the official quotation remained unaltered. On the basis of the present ordinary capital, the total for the year is 10 per cent, so that the yield on the shares, at the present cum-dividend price, is just about 5 per cent. With the new shares, issued for cash last July, ranking for the latest payment, the net amount involved in the total distribution is some £117,000 larger at £535,000. Taxation takes more than six times as much as the ordinary stockholders receive, and is again largely responsible for the limitation of the expansion in group net earnings, at £2·9 million, to 7 per cent above the 1952 level.

Price Changes

Although the majority of the past week's price changes have been adverse, the lists are not without their good points. Outstanding was the rise of half-a-crown in International Combustion, following the raising of the dividend from 15 to 20 per cent. Lucas added a shilling to the previous week's gain of 3s 6d, and there were improvements also in Hoover, B.E.T., Hackbridge Cable, Hackbridge & Hewittic, and Holophane. On the weaker side were several of the cable manufacturers' shares, including B.I.C.C., Enfields, Henley's, Telegraph Construction and London Electric Wire. Ericssons and Automatic Telephones both shed more than 1s, as did Parsons and Reyrolle. Tube Investments were

Week's Price Changes

Company or Board	Nom. Value	Middle price 22nd Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1953 Highest	1953 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	90⅛		3	3	3 6 3	90	83 11/16
Brit. Elec. 1974/77	100	88	−⅛	3	3	3 8 7	89	82
Brit. Elec. 1976/79	100	95		3½	3½	3 18 8	94¾	88⅛
Brit. Elec. 1974/79	100	103½xd		4¼	4¼	4 2 3	104	99¼
Overseas Electric Supply								
Calcutta Elec.	£1	19/-		6†	6†	6 6 4†	21/-	18/-
East African Power	£1	21/6		7	7	6 10 3	25/-	20/9
Nigerian Elec.	£1	24/6		10	10	8 3 4	25/-	21/6
Palestine Elec. "A"	£1	19/3	+6d	Nil	Nil	Nil	19/3	7/7
Perak Hydro-Elec.	£1	14/9		Nil	6	8 2 9	17/10	13/6
Equipment and Manufacturing								
Aberdare Cables	5/-	8/6		20	20	7 7 0*	8/9	7/4
Aerialite	1/-	11/6		88⅛	88⅛	7 13 9	11/6	8/1
Allen, W. H.	£1	51/3		15	15	5 17 0	51/-	42/10
Aron Elec. Ord.	£1	43/9		15	20	9 2 9	47/6	36/3
Assoc. Elec. Ord.	£1	45/6		20	20	4 8 0*	45/7	36/4
Automatic Tel. & El.	£1	65/-	−1/3	15	15	4 12 4	65/3	55/-
Babcock & Wilcox	£1	49/-	−1/-	18	18	—	50/-	40/4
Baldwin, H. J.	2/-	5/-xr		20	20	8 0 0	4/1	3/-
Bakelite	10/-	26/9	−3d	—	12½	4 14 0	24/9	16/-
British Aluminium	£1	38/-	+6d	12	12	6 6 4	43/10	35/-
B.I. Callender's	£1	41/-	−1/-	9	10	4 17 6	40/10	33/3
B.I. Callender's 6% Pref. ...	£1	25/6		6	6	4 14 10	26/3	23/-
British Thermostat	5/-	20/-	−1/3	30	35	—	19/-	14/-
British Vac. Cleaner	5/-	14/6	−3d	25	25	8 12 6	16/6	11/-
Brook Motors	10/-	31/6		20	20*	6 7 0	37/-	27/10
Brush Ord.	5/-	6/-		10	4	—	5/4	2/11
Bulgin, A. F.	1/-	3/3		30	30	9 4 6	3/5	2/6
Burco	5/-	13/-		35	35	6 14 8*	12/2	8/6
Chloride El. Storage	£1	49/6	+9d	15	20	4 1 0*	44/10	32/3
Clarke Chapman	£1	72/6		15	17½	4 16 6	70/6	57/6
Cole, E. K.	5/-	23/6	−6d	25	25*	5 6 5	23/9	14/2
Cossor, A. C.	5/-	8/3	−3d	10	10	6 1 3	11/4	6/4
Crabtree	10/-	27/-	−6d	17½	17½	6 9 8	32/6	23/9
Crompton Parkinson Ord. ...	5/-	15/-		11½	20	6 13 4	16/-	8/7
De La Rue	5/-	12/9		35	Nil	Nil	14/6	6/3
Decca	5/-	37/-		150	35*	4 14 7	37/9	17/6
Desoutter	5/-	17/6		18	20	5 14 3	17/6	14/3
Dewhurst	2/-	6/-		19	19	6 6 8	6/9	5/-
Dictograph Tel.	2/-	5/4½		20	20*	7 9 0	5/10	3/10
Dubilier Condenser	1/-	4/9		28	25*	5 5 3	4/4	2/10
E.M.I.	10/-	13/3	−3d	12	8	6 0 9	15/3	11/6
Electrical Components	5/-	11/3	−9d	20	20	8 17 10	12/	9/3
Elec. Construction	£1	55/-	−2/-	15	15	5 9 0	56/-	50/6
Enfield Cable Ord.	£1	20/-	−1/-	7½	5	5 0 0	24/10	17/-
English Electric	£1	42/6		15	10*	4 14 3	40/8	34/-
English Electric 3¾% Pref. ...	£1	16/-		3¾	3¾	4 13 9	16/4	14/6
Ericsson Tel.	5/-	47/-	−2/-	22†	22†*	2 6 9†*	48/9	36/-
Ever Ready	5/-	26/6	−9d	35	35	6 11 8	29/-	25/-
Falk Stadelmann	£1	38/3		15	15	7 16 10	44/3	38/3
G.E.C. Ord.	£1	41/3		22½	11½*	5 9 0	46/-	36/3
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/7	24/9
General Cables	5/-	16/9		30	30	8 19 2	17/-	14/9
Greenwood & Batley	£1	42/-		15	17½	8 6 9	41/6	38/-
Hackbridge Cable	5/-	12/9	+9d	20	20	7 16 9	13/-	10/4
Hackbridge & Hewittic	5/-	17/9	+3d	20	20	5 12 9	18/3	16/1
Hall Tel. Acc.	10/-	11/-		10	10	8 14 0	12/7	8/6
Heatrae	2/-	4/-		12½	12½	6 5 0	4/3	3/3
Henley's	10/-	15/9	−9d	20	10½*	6 13 4	19/4	16/-
Holophane	5/-	14/3	+6d	20	20	7 0 3	13/9	11/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

marked down 2s 3d, and Metal Industries remained under the influence of the interim dividend reduction. R. A. Lister rose 1s 3d to 36s 3d upon the advance in dividend from 9 to 12 per cent. Desoutter changed hands at 18s: the dividend of 20 per cent is 2 per cent better than that of a year ago.

Taylor Tunnicliff Results

Taylor Tunnicliff (Electrical Industries) doubled the ordinary capital during the past year through a share-for-share capital bonus. As in the case of English Electric, the rate of dividend is now being scaled down in proportion to the larger number of shares ranking for it, the 12½ per cent payment declared for 1953 being equal, in terms of money, to last year's 25 per cent. Group profits are below those of the previous year, but with a smaller tax charge the net surplus comes out a little larger at £164,000. This again gives excellent cover for the distribution, and the absence of any improvement in the latter was received in the market with some disappointment. After easing to 11s 9d, the 5s ordinary are quoted to yield £5 6s 5d per cent.

in Electrical Investments

Company or Board	Nom. Value	Middle price 22nd Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1953 Highest	1953 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	30/3	+2/-	35	25	4 2 8	26/10	20/3
I.C.I.	£1	57/9	+1/3	13	15	5 3 0	54/-	41/6
Intl. Combustion	5/-	17/6	+2/6	15	20	5 14 3	15/6	12/1
Johnson & Phillips	£1	50/-	−6d	15	15	6 0 0	59/3	49/-
Lancashire Dynamo	£1	45/-		12½	12½	5 11 0	47/-	41/-
Laurence, Scott	5/-	15/3		15	15	4 18 3	14/6	11/9
Lister, R. A.	£1	36/-	+1/3	9	12	6 12 8	34/3	27/9
London Elec. Wire	£1	40/-	−2/-	12½	15	3 15 8°	38/3	26/-
J. Lucas	£1	58/-	+1/-	9⅛	10⅝	3 14 9	51/3	35/6
Marryat & Scott	2/-	5/3		22½	22½	8 11 6	6/3	5/1
Mather & Platt	£1	56/-	+2/-	12½	15	5 7 2	53/10	41/3
Metal Industries	£1	32/-	−1/6	15	12°	—	47/9	37/9
Midland Elec. Mfg.	£1	65/-		15	15	4 12 4	63/9	56/3
Morphy Richards	4/-	19/-		40	40	8 8 6	16/3	13/-
Murex	£1	52/-	−1/6	15	15	5 15 5	60/9	50/6
Newman Ind.	2/-	2/4½		10	10	8 8 6	2/10	2/-
Oldham & Son	1/-	2/9		35	17½°	6 7 3	2/10	2/2
Parnall (Yate)	5/-	5/3	+3d	6	6	5 14 3	4/9	2/6
Parsons, C. A.	£1	43/9	−1/3	10°	12½	—	48/-	27/9
Plessey	5/-	44/3		25	30	3 7 10	37/-	20/1
Pye Deferred	5/-	19/-	−6d	18	20	—	16/3	10/6
Revo	10/-	17/6	−3d	27½	27½	—	17/6	13/11
Reyrolle	£1	71/3	−1/3	10°	12½	—	79/-	51/-
Rheostatic	4/-	11/3		16½	19	6 15 0	12/-	8/-
Richardsons Westgarth	5/-	10/-		12	15	7 10 0	11/1	8/6
Scottish Cable	4/-	13/6	−3d	32	20°	5 18 6	13/3	11/1
Siemens Ord.	£1	38/3		10	10	5 4 7	37/-	31/6
S. Smith (England)	4/-	13/9	−3d	12½	15	4 7 3	12/6	7/11
Southern Areas	£1	18/-		5	6	6 13 4	19/7	10/3
Strand Elec.	5/-	8/9		17½	17½	10 0 0	10/-	7/9
Sturtevant	5/-	34/-		17½†	18·1†°	—	29/9	20/10
Sun Elec.	£1	25/-		15	15	12 0 0	27/-	24/6
Switchgear & Cowans	5/-	12/6		22½	22½	9 0 0	16/9	12/6
Taylor, T.	5/-	11/9	−6d	25	12½*	5 6 5	12/3	9/6
T.C.C.	10/-	43/9		20	20°	—	42/6	31/5
T.C. & M.	£1	32/6	−1/-	10	8½°	5 4 7	31/6	25/6
Telephone Mfg.	5/-	8/6		10	10	5 17 8	9/4	7/1
Thorn Elec.	5/-	16/-	−6d	12½	12½	3 18 2	14/-	7/10
Thornycroft	£1	36/3		15	15	8 5 6	54/-	29/9
Tube Investments	£1	66/3	−2/3	15°	15	4 10 6	71/9	54/-
Vactric	5/-	10/-	+6d	Nil	Nil	Nil	10/3	3/6
Veritys	5/-	7/-		7½	10	7 2 9	5/4	4/1
Wallsall Conduits	4/-	46/3		70	70°	6 4 6	47/6	43/9
Ward & Goldstone	5/-	43/9		45	45°	5 2 9	46/-	29/9
Watford	2/-	5/3		25	25	—	5/6	4/10
Westinghouse Brake	£1	66/3	−2/6	14	15	4 10 6	64/-	51/3
West, Allen	5/-	14/-		15	15	5 7 3	14/4	10/3
Wolf Electric	5/-	13/6		—	15	5 11 0	12/8	9/6
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	84½	+1	—	6	7 2 0	91	77
Ord.	100	52½		—	3¾	7 2 10	57½	53
Anglo-Portuguese	£1	22/9	−6d	8	8	7 0 8	23/9	20/1
Brit. Elec. Traction:								
Def. Ord.	5/-	42/-	+1/-	25	35	4 3 4	39/6	21/3
Cable & Wireless:								
Ord.	100	165½		8	9	5 8 9	148	124
4% Loan	100	97½		4	4	4 2 1	97¾	93
Calcutta Trams	£1	19/-		6†	2½†	—	23/6	16/-
Cape Elec. Trams	£1	14/-		5½	5½	7 17 3	13/-	9/-
Marconi Marine	£1	28/9		10	10	6 19 2	31/6	26/9
Oriental Tel. Ord.	£1	80/-		16	16	—	75/-	59/-
Telephone Props.	£1	4¾		8	8	—	126/3	33/-
Telephone Rentals	5/-	9/6		10	10°	—	10/-	6/8

Miscellaneous Matters

The 2s ordinary shares of Permali, Ltd., were introduced last week to the Stock Exchange, and dealings have been taking place up to 3s. A dividend of not less than 11 per cent for the year ending next month was forecast in the published particulars of the issue. Enfield Rolling Mills £1 shares have changed hands at 54s since the company's proposal of an 80 per cent capital bonus. A statement regarding dividend prospects on the enlarged capital was due to go out to stockholders to-day, Friday. Peto Scott shares, at 1s 9d, recovered an initial setback on the passing of the ordinary dividend.

Brush and Tillings

The revival in the price of Brush Electrical Engineering 5s shares was consolidated by news of the deal whereby Thos. Tilling, Ltd., is to acquire the two million Brush shares held by Associated British Engineering. A sum of over £500,000 appears to be involved. Tillings' operations, since the sale of the transport interests six years ago, have been those of an industrial investment and holding enterprise. For a long time, Brush shares have been under the restraining influence of the group's fresh capital problem, alleviated to some extent last year by the convertible preference stock issue. The market view is that Brush stockholders have every reason, from that point of view in particular, to be satisfied over the decision of Tillings to take an interest. Dealings in Brush shares have been taking place at 6s or a little under during the past few days, and in the convertible preference, at around 22s.

I.C.I. Capital

Imperial Chemical Industries' new capital proposals are on the grand scale and, to judge by the initial market reaction, they satisfy the expectations which have been rising for some weeks past. Among the salient points in the plan is the intended 100 per cent scrip bonus for ordinary stockholders. At the same time, the preference capital is to be rearranged, and both classes of stockholders will be invited to participate in the largest industrial issue ever to be made in this country, namely an

offer of £30 million 4½ per cent unsecured loan stock, redeemable 1972–74, at 100. Finally, stockholders are told that the profits of the past year are estimated to exceed those of 1952, and that they can expect a final dividend of 9 per cent, making a total of 15 per cent (against last year's 13 per cent) on the existing capital. On the basis of this estimate, I.C.I. shares at 57s 9d offer a prospective yield of £5 3s. Full particulars of the proposals are to be sent out early next month.

Vactric Preference Payments

Vactric, Ltd., has announced that two and a half years' dividend on the 6 per cent preference shares will be paid next month. This will clear off the arrears up to March, 1950. Satisfaction with this decision was expressed in a rise of 1s in the price of the shares concerned, which became quoted at 21s 6d, while the 5s ordinary improved further to 10s. The latter have been without a dividend for eight years. Good surpluses were shown in the company's accounts for 1950 to 1952, and although the last results, covering the year to March, 1953, showed no profit, the company and its subsidiaries were reported subsequently to be trading profitably. It was also announced in the annual report that the company's indebtedness to the Treasury had been discharged, and that a general reorganization of manufacturing arrangements had been carried through successfully.

REPORTS and DIVIDENDS

The English Electric Co., Ltd., in its report and accounts for the year to 26th December last, shows group profits of £4,779,970, after deducting depreciation of £1,262,460, as compared with a profit of £4,359,034 for the preceding year. Taxation requires £3,226,023, leaving a net balance of £1,553,897, of which £1,546,995 is attributable to the company. It is proposed to pay a final ordinary dividend of 6⅔ per cent on capital of £10,616,193. This compares with a final of 10 per cent paid in the previous year on capital of £5,308,097 before the "rights" and free scrip issues. The interim dividends for both years were 5 per cent.

The Marconi International Marine Communication Co., Ltd.—The profit of the company and its wholly-owned English subsidiaries for 1953, after meeting all charges except taxation, is £290,265, as compared with £337,093 for 1952. There is a net balance of £122,424 (against £77,093). General reserve receives £72,157 and depreciation equalization reserve £25,000. It is proposed to pay a final dividend of 6 per cent, again making 10 per cent for the year.

Marconi's Wireless Telegraph Co., Ltd., reports a profit for the year to 26th December last, after meeting all charges, including £108,815 for depreciation, of £862,283, as compared with £576,704 for the previous year. Taxation requires £566,294, leaving a net profit of £295,989 (against £192,177). General reserve receives £275,000 and the ordinary dividend for the year is maintained at 7 per cent.

D. Napier & Son, Ltd.—The accounts for the year to 26th December last show a profit of £265,012, as compared with £322,436 for 1952, and after deducting £154,000 for taxation, the net balance is £111,012 (against £98,436). An ordinary dividend of 7½ per cent is unchanged for the year.

International Combustion (Holdings), Ltd., reports group profits for the year ended 30th September last of £1,627,916, as compared with £1,580,403 for the preceding year, and after providing £1,099,694 for taxation, the net profit is £528,222 (against £464,642). It is proposed to pay a final dividend of 15 per cent, making 20 per cent for the year on capital increased by a 100 per cent free scrip issue. The distribution for the previous year was also 20 per cent, but the interim dividend of 10 per cent was paid on capital before the scrip issue.

Taylor, Tunnicliff (Electrical Industries), Ltd., reports a group profit, etc., of £393,293 for 1953, as compared with £423,870 for the preceding year, and after deducting taxation of £164,125, the net profit is £163,887 (against £157,655). It is proposed to pay a dividend for the year of 12½ per cent on capital doubled by a scrip issue, equal to 25 per cent paid for 1952 on the smaller capital. A sum of £20,000 is written off goodwill, and after capitalizing £305,000, the balance carried forward is £306,725 (against £520,298 brought in).

Mather & Platt, Ltd., in a preliminary statement, show a consolidated net profit for 1953 of £558,606, an increase of £129,816 as compared with the preceding year. Taxation absorbed £846,166. Of the net profit £140,662 is retained by subsidiaries, and after adding £111,367 brought in, the balance available is £529,311. It is proposed to place £217,869 to general reserve and to pay a final ordinary dividend of 6 per cent, and a bonus of 5 per cent, again making 15 per cent for the year.

Thomas Bolton & Sons, Ltd., in a preliminary statement, report a trading profit for 1953 of £381,819, as compared with £799,807 for 1952. After providing £80,899 for depreciation and £22,390 for taxation, the net profit is £245,138 (against £202,493). General reserve receives £150,000, and it is proposed to maintain the dividend for the year at 12½ per cent, by a final dividend of 7½ per cent and a bonus of 2½ per cent. The balance carried forward is £183,192 (against £152,977 brought in).

Waygood-Otis, Ltd., reports a trading profit for 1953 of £587,916, as compared with £382,126 for the preceding year. Depreciation absorbs £24,627 and taxation £365,000. It is proposed to pay a final dividend of 25 per cent, making 65 per cent for the year (against 55 per cent). The balance carried forward is £66,851 (against £27,891 brought in).

Desoutter Brothers (Holdings), Ltd.—A group profit of £127,938, after providing £254,243 for taxation, is shown for 1953, as compared with £65,366 for 1952. It is proposed to pay a final ordinary dividend of 12½ per cent, making 20 per cent for the year (against a first and final dividend of 18 per cent). The balance carried forward is raised from £30,232 to £69,000.

Enfield Rolling Mills, Ltd., proposes to make an issue of four new ordinary £1 shares for every five £1 stock units held. The directors state that the issue must not be regarded as implying an increase in the amount of the future dividend distribution.

Associated British Engineering, Ltd., announces that it has agreed to sell to Thomas Tilling, Ltd., at the current market price its holding of two million ordinary shares of the Brush Electrical Engineering Co., Ltd.

Baird Television, Ltd., announces that a provisional contract has been entered into to acquire the entire issued capital of Hartley Electromotives, Ltd., Hartley Installations, and Duratube & Wire, Ltd. The consideration is to be the issue of 200,000 6½ per cent cumulative redeemable £1 preference and 2,000,000 "A" ordinary 1s shares, the latter to rank for two-thirds of divisible profits after preference payments. The existing 5,840,000 ordinary in issue will become "B" ordinary and rank for one-third of any divisible surplus. Although future profits of the Hartley group will be available to Bairds, the directors point out that the payment of dividends may not be possible for some time. This is because of the necessity to deal with accumulated past losses. As at 31st March last, Baird Television carried forward a deficit of £254,992. In order to effect the amalgamation the authorized capital of Baird's will be increased to £800,000 and reorganized so as to consist of 200,000 6½ per cent £1 preference, 2,000,000 "A" 1s ordinary, 6,173,333 "B" 1s ordinary and 3,826,667 1s ordinary.

On the merger becoming effective, Mr. R. G. Cooke will join the board as deputy chairman, Mr. A. W. M. Hartley as managing director, Mr. J. W. McFetridge as financial director, and Mr. F. M. Hamer also representing the Hartley interests. Sir Charles

King while remaining chairman of Baird Television, will join the boards of the three main companies comprising the Hartley group. It is proposed to change the name of the company to Hartley Baird, but television sets will continue to be sold under the name of Baird Television. An extraordinary meeting to consider the proposals will be held on 15th March.

Lightfoot Refrigeration, Ltd., has declared an interim dividend of 3 per cent (unchanged).

New Companies

Bendix, Ltd. — Registered 15th February. Capital £100. Electrical engineers and contractors, electricians, instrument makers and constructors, etc. The first directors are to be appointed by the subscribers. Solicitors: Slaughter & May, 18, Austin Friars, London, E.C.2.

Black Automatic Controls, Ltd.— Registered 15th February. Capital £2,000. Manufacturers of and dealers in automatically controlled valves for use in the control of the flow of gas, water, oil, steam, air or any other fluid, etc. The first directors are to be appointed by the subscribers. Solicitors: Bailey & Co., 199, Marylebone Road, London, N.W.1.

Liquidation

Electric Tool Development Co., Ltd. —Winding up voluntarily. Liquidator, Mr. D. A. Lumley, 2, Burwood Road, Hersham, Surrey, appointed 10th February.

Bankruptcies

J. G. Milne, carrying on business at 34, Whitworth Road, Grangetown, Yorks., radio and electrical dealer.—Last day for receiving proofs for dividend 12th March. Trustee, Mr. C. G. Sparrow, 62–63, High Street, Stockton-on-Tees.

G. H. Battye, Post Office Row, Escrick, Yorks., plumber and electrician, lately residing at 9, Lidget Hill, Pudsey, and carrying on business at Clifton Road, Pudsey.—Trustee, Mr. W. H. Meredith, 29, East Parade, Leeds, 1, Official Receiver, released 11th February, 1954.

Electrical Commercial Travellers

THERE was a gathering of 600 (a record) at the annual luncheon of the Electrical Trades' Commercial Travellers' Association held at the Connaught Rooms, London, W.C.2, on Friday last, over which Mr. E. J. Shuter (chairman), presided. The guests included many well-known men in the electrical industry.

The toast of the Association was proposed by Mr. J. Eccles, deputy chairman (operations) of the British Electricity Authority, who said that the time was fast approaching when the traveller would have to travel farther still. He had recently met a man from New Zealand who wanted better service from British concerns to enable him to buy British in face of growing competition from Japan and Germany. He wanted to know why British companies did not send their own commercial travellers instead of leaving so much in the hands of third parties. Mr. Eccles referred to the success of the B.E.A. in meeting demands during the recent cold spell and said that its productivity was now 60 per cent greater than in 1948. They were not yet out of the wood, however, and at times it was touch and go. To make the best use of generating plant and to provide electricity at the cheapest possible price, they had to fill up the valleys in the load curves. The commercial traveller was in the front line in this drive for cheaper power and competitive exports, because our ability to sell abroad depended upon economical production and a stable home market. He paid a tribute to the good work of the Association on behalf of the E.I.B.A. and the Royal Commercial Travellers' Schools.

Mr. T. B. O. Kerr, the president, responding, said that salesmen played a vital part in industry, and in the electrical industry in particular they must have a high degree of technical knowledge. The toast of the guests was proposed by Mr. A. C. Franklin and Mr. H. H. Armytage replied.

Mr. F. N. Woods, in proposing the health of the chairman, referred to the growth of the Association, and asked the members to attend the general meetings in larger numbers. Mr. Shuter responded, and announced that Mr. S. Johnson's appeal, made earlier in the proceedings, on behalf of the Association's charities, had resulted in a record collection of £160.

Left to right: Mr. J. Eccles, Mr. T. B. O. Kerr, Mr. E. J. Shuter and Mr. H. H. Armytage

LIGHTING NOTES

ST. HELENS Corporation Lighting Committee is seeking Ministry approval to equip 32 streets in the central area of the town with a mercury vapour electric lighting system at an estimated cost of £10,767.

The borough surveyor of ECCLES has prepared a scheme for the lighting of Parrin Lane, Monton Green, Monton Road and Half Edge Lane from Worsley Road to Eccles Old Road, to Group "A" standards, at an estimated cost of £7,000.

MIDDLESBROUGH Town Council has informed the divisional road engineer of the Ministry of Transport that it is gravely dissatisfied with the decision to allow the Council to spend only £6,000 this year on street lighting. This figure is considered by the Council to be totally inadequate in view of the condition of the town's street lighting.

THORNABY-ON-TEES Town Council has adopted a policy of converting street lighting from gas to electricity. Trunk and classified roads will be dealt with first and the cost, estimated at £14,500, is to be spread over several years. About 500 street lights are involved.

NELSON (Lancs) Corporation has asked its borough surveyor to prepare a report on the possibility of a general improvement of street lighting in the town, together with comparative estimates for gas and electric lighting.

BURTON-ON-TRENT Public Works Committee has recommended that 126 gas street lamps on unclassified roads should be replaced by Group "B" type electric lamps.

Schemes, estimated to cost £1,100 and £1,550 respectively, for the provision of improved street lighting in Spitalfields Lane and Whyke Road, CHICHESTER, have been recommended to the City Council for approval.

Discussions are in progress between the East Midlands Electricity Board and BOSTON (Lincs) Town Council with a view to the replacement of all existing gas lamps with electric lamps.

DAGENHAM Corporation Highways and Works and Finance Joint Committee recommends a scheme costing £12,000 for the substitution of 320 electric street lighting units for 182 gas lighting units.

MAIDENHEAD Corporation Highways Committee is pressing the Transport Ministry to agree to fluorescent lighting for part of the A4 loopway in the town.

BENTLEY (Yorks) U.D.C. is to proceed with a £9,000 scheme for lighting two miles of the Great North Road north of Doncaster with sodium lamps.

WEST HARTLEPOOL Corporation Works Committee has decided to seek permission to spend £33,036 converting the town's street lighting from gas to electricity.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 7th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

30158. Watliff Co., Ltd.—Commutators. 23rd February, 1951. (706766.)

1950

2201. Standard Telephones & Cables, Ltd.—Production of multi-conductor cables. 26th January, 1951. (706971.)

13768. Marconi's Wireless Telegraph Co., Ltd.—Transformer circuit arrangements. 28th March, 1951. (706972.)

14410. Ashley Accessories, Ltd.—Thermally actuated electric switches. 11th June, 1951. Cognate application 14411, 9th June, 1950. (706843.)

14878. Speed Development Co., Ltd.—Fluid-pressure-operated electric switches. 26th April, 1951. (706770.)

15158. Minister of Supply.—Electrical signal generating systems. 20th June, 1951. (706687.)

18847. M-O Valve Co., Ltd., and Clarke, G. M.—Electrical amplifying devices of the travelling wave kind. 5th October, 1951. (706909.)

21221. English Electric Co., Ltd.—Universal pivot support mechanisms. 24th August, 1951. (706913.)

26406. Simplex Electric Co., Ltd.—Toasters. 29th January, 1952. (706695.)

29024. Licentia Patent-Verwaltungs-Ges.—Wire unwinding device for winding machines. 27th November, 1950. (706978.)

30959. Electro-Hydraulics, Ltd. — Gear pumps and motors. 11th December, 1951. (706979.)

1951

854. English Electric Valve Co., Ltd.—Magnetrons. 30th October, 1951. (706848.)

917. Hackbridge & Hewittic Electric Co., Ltd.—Grid-controlled electrical power rectifying apparatus. 2nd January, 1952. (706980.)

919. Western Electric Co., Inc.—Methods and apparatus for producing germanium crystals. 12th January, 1951. (706849.)

3971. Standard Telephones & Cables, Ltd.—Radio receivers. 15th February, 1952. (706776.)

5241. Quaker Oats Co.—Method and apparatus for the electrostatic separation of corn from its impurities. 5th March, 1951. (706705.)

5545. General Electric Co., Ltd., Mitchell, K. J., and Denny, R. J. S.—Material handling apparatus. 5th March, 1952. (706706.)

6711. M-O Valve Co., Ltd., and Grey, L. E.—Thermionic valves. 17th March, 1952. (706707.)

6712. General Electric Co., Ltd., and Grey, L. E.—Thermionic and secondary emission cathodes. 17th March, 1952. (706708.)

6906. Metropolitan-Vickers Electrical Co., Ltd.—Electronic control apparatus. 6th November, 1951. (706780.)

6928. Pye, Ltd.—Cameras, particularly television cameras. 24th March, 1952. (706922.)

8078. English Electric Valve Co., Ltd.—Very high frequency wave energy generator arrangements. 11th March, 1952. (706923.)

9014. Standard Telephones & Cables, Ltd.—Telephone subscriber sets. 10th April, 1952. (706784.) 9767. Telephone subsets. 18th April, 1952. (706785.)

10773. Allis-Chalmers Manufacturing Co.—Gas-blast electric circuit breakers. 8th May, 1951. (706786.)

10940. General Electric Co., Ltd., Friedlander, E. S., and Milner, M.—Protective devices for alternators or synchronous alternating current motors. 9th May, 1952. (706992.)

13634. Western Electric Co., Inc.—Production of semi-conductive bodies. 8th June, 1951. (706858.)

13712. General Electric Co., Ltd., and Imm, R. C.—Electrical pulse slicing arrangements. 4th June, 1952. Cognate application 27727, 26th November, 1951. (706715.)

14366. Smith & Sons (England), Ltd., S.—Control of the rotational direction of electric motors. 23rd May, 1952. (706994.)

14495. Research Corporation.—Systems for energizing electrical precipitators. 19th June, 1951. (706929.)

16460. British Telecommunications Research, Ltd.—Telecommunication systems employing phase or frequency modulation. 24th June, 1952. (706793.)

16940. British Thomson-Houston Co., Ltd.—Luminescent materials and methods of manufacturing same. 17th July, 1951. (706998.)

20715. Laing, N.—Electric pumps for barrels and the like. 3rd September, 1951. (706797.)

21898. Radio Corporation of America.—Gas-filled electric discharge devices. 18th September, 1951. (706722.)

22735. Marconi's Wireless Telegraph Co., Ltd.—Amplifiers for driving electro-magnetic deflector systems for cathode-ray tubes. 21st May, 1952. (706867.)

24025. Metropolitan-Vickers Electrical Co., Ltd.—Radio frequency control circuits. 4th September, 1952. (706940.)

24287. General Electric Co., Ltd., and Walsh, A. S.—Directive radio aerial systems. 16th October, 1952. (706725.)

24716. Glover & Co., Ltd., W. T.—Apparatus for storing a length of cable or the like long flexible article. 22nd October, 1952. (706726.)

25438. Licentia Patent-Verwaltungs-Ges.—Electric unsymmetrically conductive systems, particularly dry-plate rectifiers. 31st October, 1951. (707008.)

26078. Metropolitan-Vickers Electrical Co., Ltd.—Turbine rotors. 7th November, 1951. (706730.)

26547. Clark, D'A. M. (Technicolor Motion Picture Corporation).—Photo-electric tubes. 13th November, 1951. (706732.)

26947. Radio Corporation of America.—Gas-filled electric discharge tube. 16th November, 1951. (706733.)

27675. Cosmocord, Ltd., and Dewsall, J. F.—Transducers. 25th November, 1952. (706808.)

1952

213. Ferranti, Ltd.—Metallic diaphragms for the transmission of high frequencies. 1st January, 1953. (706810.)

260. British Tabulating Machine Co., Ltd.—Electrical storage devices. 3rd January, 1952. (706736.)

1813. Licentia Patent-Verwaltungs-Ges.—Circuit for the synchronous control of step-by-step switch devices. 22nd January, 1952. (706880.)

2287. Compagnie Générale de Télégraphie sans Fil.—Blown air cooling internal radiator for ceramic dielectric tubular condensers of great reactive power. 28th January, 1952. (707015.)

6640. Standard Telephones & Cables, Ltd.—Travelling wave tubes. 14th March, 1952. (706958.)

7332. Compagnie Générale de Télégraphie sans Fil.—Electrical capacitors or insulators. 21st March, 1952. (706887.)

7532. General Electric Co., Ltd., and Bryden, J. E.—Arrangements for supplying phase modulated electric oscillations. 12th March, 1953. (707027.)

8023. Marconi's Wireless Telegraph Co., Ltd.—Wide band thermionic valve amplifiers. 2nd January, 1953. (707029.)

8394. British Thomson-Houston Co., Ltd.—Resonant windows in wave-guide apparatus. 2nd April, 1952. (706819.)

8706. Mallory Batteries, Ltd.—Electric cells. 4th April, 1952. (706822.)

9079. Philips Electrical Industries, Ltd.—Single-sideband carrier-wave telephone systems. 9th April, 1952. (707030.)

9689. Philips Electrical Industries, Ltd.—Electrical wave-guide systems for producing a phase difference between two output waves. 17th April, 1952. (706824.)

11781. English Electric Co., Ltd.—Discharge regulators. 1st May, 1953. (706826.)

12314. Metropolitan-Vickers Electrical Co., Ltd.—Recording of transients. 15th May, 1952. (706749.)

15795. Busch-Jaeger Lüdenscheider Metallwerke Akt.-Ges.—Holders for electric discharge lamps. 23rd June, 1952. Addition to 703974. (706755.)

17729. Philips Electrical Industries, Ltd.—Marking circuit arrangement for positioning a final selector switch. 14th July, 1952. (707038.)

20070. Zenith Radio Corporation.—Television receivers. 8th August, 1952. (706758.)

Unusual Telecommunication Transformers

Nature reports the development at the Bell Telephone Laboratories of a special small transformer for use in the amplifying units of carrier systems working on coaxial cable and which is wound without wire. The outer and inner formers consist of thin-walled cylinders, about the size of cotton reels, of " Vicor " glass, a borosilicate glass chosen because of its stability and resistance to physical change. They are ground so that they have accurately constant (to within 10^{-4} in) diameters, and threads are then cut with a diamond wheel into the cylinders. A coating of powdered silver and ground glass is sprayed on, and copper is then electroplated on to the formers. The excess copper is removed, and fine and exact wire coils consisting of the copper in the grooves are obtained. The threads are cut in an unusual form so that the coils ultimately obtained can neither expand nor shrink. Such transformers are being manufactured by the Western Electric Company.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 1st March

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "Research in the Electrical Manufacturing Industry," by L. J. Davies. (Joint meeting with the South Midland Supply and Utilization Group.)

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "Safety Precautions in Electricity Supply from the point of view of the Supply Authority, the Manufacturer, and H.M. Inspector of Factories," by B. L. Williams, R. N. Buttrey and E. Sutton.

IPSWICH.—Crown & Anchor Hotel, 6.30 p.m. I.E.E. Ipswich district meeting. "Grain Drying by Electricity," by W. Cover.

LEEDS.—The University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorks Branch. Annual general meeting.

Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Control Gear," by R. F. Mathieson.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Some Design Features of the Semi-Outdoor Power Station at Ince," by F. H. S. Brown.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. London Students' Section. "Industrial Consumer Installation Practice," by J. J. Peacock.

Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Hydrogen Cooled Alternators," by H. M. Oliver.

MAIDSTONE.—"Wig & Gown," 7.30 p.m. I.E.E. Maidstone district meeting. "Electric Lifts in Post-War Housing," by C. G. L. Morley.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "Some Applications of the Electrolytic Tank to Engineering Design Problems," by H. Diggle and E. R. Hartill.

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Association Affairs," by E. A. Bromfield.

Tuesday, 2nd March

COVENTRY.—Technical College, 7.30 p.m. Institution of Engineering Inspection, Coventry Branch. "High Quality Sound Reproduction," by J. A. Leslie.

ELTHAM.—Congregational Church Hall, Court Road, 8 p.m. A.S.E.E. South East London Branch. "Manufacturing."

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "Industrial Electronics," by T. S. Worthington.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. "Current and Power Relationships in the Measurement of Iron Losses in a Three-Limbed Transformer Core," by Prof. F. Brailsford. "An Automatic Plotter for Magnetic Hysteresis Loops," by H. McG. Ross.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "A Short Review of Modern Fundamental Electromagnetic Theory," by P. Hammond.

NOTTINGHAM.—Victoria Station Hotel. Incorporated Plant Engineers, East Midlands Branch. Annual dinner.

OLD PORTSMOUTH.—B.E.A. Conference Rooms, High Street, 7.30 p.m. A.S.E.E. Portsmouth Branch. Lecture.

Tuesday, 2nd March, to Saturday, 27th March

LONDON.—Olympia.—Ideal Home Exhibition.

Wednesday, 3rd March

BARNSLEY.—Town Hall, 7 p.m. I.E.E. North Midland Centre. "Some Researches on Circuit-Breaking by means of High-Voltage Circuit-Breakers, with special reference to Current-Chopping," by A. F. B. Young. (Joint meeting with Sheffield Sub-Centre).

BIRMINGHAM.—James Watt Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. "Developments and Future Possibilities in Electricity Generation," by Sir John Hacking.

CHELMSFORD.—Public Library, 7 p.m. I.E.E. London Students' Section, district meeting. "Metallic Resistance at High Frequency," by A. D. Stevens.

EDINBURGH.—12, Rothesay Place, 7 p.m. I.E.S. Edinburgh Centre. "Church Lighting," by L. C. Rettig.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 7 p.m. I.E.E. South-West Scotland Sub-Centre. Parsons Memorial Lecture: "Continuity of Electricity Supply," by H. Leyburn.

HOVE.—S.E.E.B. Headquarters, 6.30 p.m. I.E.E. Southern Centre. "Technical Arrangements for the Sound and Television Broadcasts of the Coronation Ceremonies on 2nd June, 1953," by W. S. Procter, M. J. L. Pulling and F. Williams.

LONDON.—I.E.E. London Students' Section. Visit to G.P.O. Research Station, Dollis Hill, N.W.2, at 2.15 p.m.

At the Royal Society of Arts, John Adam Street, 7 p.m. Institution of Electronics. "Applications of Radio Isotopes," by E. W. Jones.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Teesside Sub-Centre. "A New Approach to the Theory and Operation of Electrostatic Precipitators for use on Pulverized-fuel-fired Boilers," by N. Troost.

NEWCASTLE - UPON - TYNE.—Royal Turk's Head Hotel. North East Electrical Club. "Electric Traction," by J. Milne.

Connaught Hall, Y.M.C.A., Blackett Street, 6.15 p.m. I.E.S. Newcastle Centre. "Dark Adaptation and Miners' Nystagmus," by W. J. Wellwood Ferguson.

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. Annual general meeting.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Transformer-Analogue Network Analysers," by M. W. Humphrey Davies and G. R. Slemon.

Thursday, 4th March

BRISTOL.—University Chemical Department, Woodland Road, 7 p.m. Institute of Fuel, Western Section. "National Fuel Resources and their Utilization," by Dr. A. Parker.

CARDIFF.—South Wales Electricity Board's Demonstration Theatre, The Hayes, 5.45 p.m. I.E.S. Cardiff Centre. "Glass in the Lighting Industry," by J. G. Holmes.

CHELTENHAM.—Cadena Café, High Street, 6.30 p.m. I.E.S. Gloucester and Cheltenham Centre. "Some Aspects of Department Store Lighting," by A. W. Jervis.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. Branch lecturettes.

EDINBURGH.—George Hotel, 7 for 7.30 p.m. I.E.E. Scottish Centre. Annual dinner.

The University, 7 p.m. British Institution of Radio Engineers, Scottish Section. Members' papers.

GLASGOW.—39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. "Aerodrome Lighting," by A. V. Campbell.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "Submerged Telephone Repeaters for Shallow Water," by R. J. Halsey and F. C. Wright. "The Netherlands–Denmark Submerged-Repeater System," by A. H. Roche and F. O. Roe. "British Post Office Standard Submerged-Repeater System for Shallow-Water Cables, with special mention of the England–Netherlands System," by D. C. Walker and J. F. P. Thomas.

NOTTINGHAM.—E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Brains Trust."

PETERBOROUGH.—Eastern Gas Board's Demonstration Theatre, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "Welding for Maintenance," by J. S. Skelton.

SOUTHAMPTON.—Polygon Hotel, 7.30 p.m. Incorporated Plant Engineers, Southampton Branch. Annual general meeting.

Friday, 5th March

BELFAST.—Grand Central Hotel, 7.30 for 8 p.m. Belfast Association of Engineers. Annual dinner and dance.

BIRMINGHAM.—Grand Hotel, 6.30 for 7 p.m. Birmingham Electric Club. Annual dinner.

LEEDS.—Great Northern Hotel, Wellington Street. Leeds Association of Engineers. Annual dinner and dance.

LIVERPOOL.—9, The Temple, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. Lecture.

LONDON.—Restaurant Frascati, Oxford Street, 6.30 for 7 p.m. Incorporated Plant Engineers, London Branch. Annual dinner and dance.

NOTTINGHAM.—Victoria Station Hotel, 6.45 for 7.15 p.m. I.E.E. East Midland Centre. Annual dinner.

WEYMOUTH.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Demonstrations of Synthetic Speech," by W. Lawrence and R. A. Eades.

Saturday, 6th March

LONDON.—I.E.E. London Students' Section. 10.30 a.m. Visit to Sadler's Wells Theatre, E.C.1.

N.U.M. CONFERENCE

The National Union of Manufacturers, 8, Holborn Viaduct, London, E.C.1, proposes to hold a conference at Harrogate from 20th to 22nd October next. The proceedings will comprise "work sessions," the annual general meeting and a dinner-dance. Subjects provisionally put down for discussion are Commonwealth trade, industrial finance, exports to dollar and other markets, fuel efficiency, transport problems, modern costing and human relations in industry.

News from South Africa

From Our Cape Town Correspondent

THE South African Agricultural Union has adopted in principle a scheme under which the Government will be asked to set up a South African rural electrification administration with £5,000,000 capital to make loans to the Electricity Supply Commission for rural transmission lines and transformers. The president of the Eastern Province Coastal Agricultural Union, which initiated the scheme, said that his recommendations for promoting rural electrification schemes had been referred to the executive committee of the Union.

It is proposed that the rural electrification administration, to which the Government would contribute £1,000,000 for five years, should co-operate with a rural electrification section of "Escom" in deciding what schemes to undertake. The administration should make loans to farmers through co-operatives for the purchase of electrical equipment, the co-operatives providing technical services to their members. The generation of electricity should ultimately become the sole function of "Escom" as municipal plants became obsolete. "Escom" should continue to evolve an overall electrification plan for the country. A representative of the farming community should be appointed a member of "Escom" to ensure co-operation with the farming community through the South African Agricultural Union for the regional planning of the country.

Increased Electricity Charges

A 25 per cent increase in electricity tariffs in the Western Cape is now in operation, but the new charges do not apply to the Cape Town municipal area or to the local authorities which obtain electricity from the Cape Town municipal power stations. Industrial working costs are not expected to be greatly affected. This is the first tariff increase that "Escom" has found necessary in the Cape Western undertaking, where consumers have enjoyed exceptionally low tariffs for more than 20 years.

Cape Town Undertaking's Finances

Cape Town's electricity undertaking is expected to yield a surplus of £402,886 for 1953, according to a report by the city electrical engineer. It was originally estimated that it would be £254,241. The new figure takes into account supplemental votes of £90,759 to cover the increased cost of coal, the cost of assistance from Hex River power station and cost of living allowances. The "extra surplus" total of £148,645 includes £21,484, the decrease in the estimated expenditure for 1953, a further £57,900 from the surcharge of 5 per cent imposed on all tariff rates from September, 1953, £44,993 from an increase of 1,000,000 kWh sold and £46,280 from revenue from work done for private persons. The revenue for 1954 is estimated at £3,283,171 and expenditure at £3,033,650, leaving an estimated surplus of £249,521. Of this £213,030 should come from increased charges.

Making reference to contributions for the relief of the rates, the city electrical engineer comments that "the large amounts which the undertaking is being called upon to contribute and the fact that the tariff rates for electricity are increased to provide profits for the relief of rates causes me to recommend once again that serious consideration be given towards establishing some formula for the amount which the undertaking should be called on to contribute and for the amount to be held in reserve."

Appliance Sales

No fewer than 25,690 electrical appliances, valued at £1,283,531, have been sold by the Cape Town City Council since 21st July, 1947, when the municipal hire-purchase scheme was revived. The sales include 7,027 cooking ranges costing £433,044; 5,360 refrigerators valued at £532,311; 3,401 washing machines valued at £181,959; 1,804 water heaters valued at £51,881; 1,457 polishers and vacuum cleaners costing £46,760; and 6,559 minor appliances, £26,611.

CANADIAN EXPORTS

Large Total Increase for Half-Year

EXPORTS of electrical machinery and apparatus from Canada during the first half of 1953 were valued at $27,456,000, nearly $11 million more than in the January–June period of 1952. Some of the leading items and destinations are given below with increases or decreases on the corresponding months of 1952. It will be seen that the total increase was largely accounted for by the trade in unspecified radio apparatus and telephone and telegraph material. In other items there were declines, some heavy.

Class of Goods	Jan.-June, 1953 $ (000)	Inc.or dec. $ (000)
Batteries, storage ..	190	+ 9
To Colombia ..	96	+ 96
„ *Venezuela* ..	38	− 42
Batteries, other ..	30	− 487
To Malaya ..	11	− 148
„ *U.S.A.* ..	16	+ 16
Radio receiving sets ..	539	− 151
To Pakistan ..	24	*
„ *U.S.A.* ..	117	+ 3
„ *Arabia* ..	21	− 34
„ *Colombia* ..	17	− 32
„ *Cuba* ..	36	+ 16
„ *Guatemala* ..	29	+ 28
„ *Japan* ..	45	+ 42
„ *Venezuela* ..	70	+ 6
Radio apparatus,n.o.p.	19,589	+ 14,742
To U.K. ..	5,869	+ 5,765
„ *Belgium* ..	320	*
„ *Denmark* ..	777	*
„ *Italy* ..	971	*
„ *Netherlands* ..	973	*
„ *Norway* ..	579	*
„ *Venezuela* ..	272	*
Telegraph and telephone apparatus ..	1,332	+ 599
To Australia ..	373	*
„ *U.S.A.* ..	887	+ 333
Meters and parts ..	515	− 863
To South Africa	24	*
„ *Brazil* ..	86	− 436
„ *Chile* ..	29	− 89
„ *Colombia* ..	41	− 28
„ *Cuba* ..	118	− 102
„ *Guatemala* ..	28	*
„ *Mexico* ..	43	− 143
„ *Venezuela* ..	24	− 70

Class of Goods	Jan.-June, 1953 $ (000)	Inc.or dec. $ (000)
Spark plugs, magnetos, etc. ..	800	− 185
To South Africa	172	− 14
„ *India* ..	101	+ 69
„ *Belgium* ..	79	+ 7
„ *Cuba* ..	41	− 13
„ *Mexico* ..	84	− 24
„ *Venezuela* ..	83	+ 10
Motors and parts ..	562	− 645
To S. Rhodesia	51	*
„ *Jamaica* ..	12	*
„ *New Zealand*	18	− 53
„ *Brazil* ..	92	− 36
„ *Cuba* ..	18	*
„ *Dominican Republic* ..	12	*
„ *Peru* ..	14	*
„ *Venezuela* ..	19	*
„ *U.S.A.* ..	275	*
Dynamos, generators and parts ..	1,332	− 530
To Brazil ..	1,080	− 462
„ *Iraq* ..	12	*
„ *U.S.A.* ..	195	*
Transformers and parts	460	− 2,001
To Brazil ..	415	− 1,753
Elec. apparatus, n.o.p.	1,848	− 26
To South Africa	67	*
„ *India* ..	31	*
„ *Jamaica* ..	28	*
„ *Brazil* ..	769	*
„ *Italy* ..	152	*
„ *Mexico* ..	59	*
„ *Switzerland*	43	*
„ *U.S.A.* ..	578	*

* Too small to record in first half of 1952.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast.—26th March. Electricity Department. Automatic fire fighting and alarm installation. (See this issue.)

Canada.—WINNIPEG.—8th March. Committee on Public Utilities. Cable, lighting standards and luminaires for street lighting. (E.S.B./4021/54. Ten/8378).*

REGINA.—30th March. Saskatchewan Power Corporation. Two 30,000 kW steam turbo-generators and exciters, two four-stage regenerative feed-water heating plants and two surface condensing plants and auxiliaries. (E.S.B./4023/54. Ten/8404.)*

Co. Down.—10th March. County Education Committee. Electrical installation in Lisnasharragh Intermediate School, Castlereagh, Belfast. F. W. Parkinson & Partners, 6, Murray Street, Belfast.

Edinburgh.—North of Scotland Hydro-Electric Board. Construction of 132 kV transmission lines between Beauly and Nairn. (See this issue.)

Eston.—15th March. U.D.C. Street lighting equipment. (See this issue.)

Hereford.—8th March. City Council. Street lighting equipment. (See this issue.)

India.—BANGALORE.—1st March. Government of Mysore Stores Purchase Committee. Fuse cut-outs for 5 kV and 15 kV service. (E.S.B./4114/54. Ten/8367.)*

BOMBAY. — 3rd May. General Manager, Central Railway, Victoria Terminus. Plant for extension of Kalyan power station, including 18,000 kW turbo-alternator, boiler plant, switchgear, transformers, cable, etc. (E.S.B. 4390/54. Ten/8406.)*

NEW DELHI.—3rd March. Director General of Supplies and Disposals. Armoured cable for railway signalling. (E.S.B./4129/54. Ten/8358.)* 4th March. Signalling cable. (E.S.B./4370/54. Ten/8389.)*

18th March. Electric cable. (E.S.B./4128/54. Ten/8363.)*

MADRAS.—24th March. Government Electricity Department. Three 7,500 kVA transformers. (E.S.B./4089/54. Ten/8376.)*

Kenilworth.—6th March. U.D.C. Electric lanterns for one year. Surveyor, Council House.

London.—India Store Department. 23rd April. Spares for wireless set No. 19. (See this issue.)

Co. Louth.—13th March. County Council. Partial rewiring and provision of electric storage heating at St. Mary's Hospital, Drogheda. C. O'Cleireachain, County Offices, Dundalk.

Manchester.—22nd March. Housing Committee. Electrical installations in houses, flats and shops. (See this issue.)

New Zealand. — AUCKLAND. — 12th March. Auckland Electric Power Board. L.v. cable. (E.S.B./4121/54. Ten/8365.)*

Skegness. — 15th March. U.D.C. Additional generating sets and electrically driven sewage pumping machinery for extensions at Richmond Drive pumping station. W. H. Radford & Son, Albion Chambers, King Street, Nottingham.

South Africa. — PRETORIA. — 11th March. Union Tender and Supplies Board. Four medium frequency radio communication receivers. (E.S.B./3964/54. Ten/8350.)* Electrical material (tender No. S.O.7745). (E.S.B./3973/54. Ten/8364.)*

JOHANNESBURG.—18th March. Stores Department, South African Railways. Electric furnace. (E.S.B./4379/54. Ten/8392.)*

Southern Rhodesia. — 5th March. Government Tender Board. Torch and cycle lamp batteries. (E.S.B./4453/54. Ten/8388.)*

Turkey. — ISTANBUL. — Municipality. Fifty trolley-buses. (E.S.B. 4532/54. Ten/8407.)*

United States.—DENVER, COLORADO. —23rd March. Bureau of Reclamation. Power transformer and spare parts. (E.S.B./4318/54. Ten/8398.)*

Uruguay.—MONTEVIDEO.—27th April. Administracion Nacional de Puertos. Electrical material for installation in ships and in a hangar. (E.S.B./13600/54. Ten/8400.)*

Whittingham.—3rd March. Hospital Management Committee. Electric lamps for one year. W. A. Higgs, secretary to the Management Committee, Whittingham Hospital, near Preston.

ORDERS PLACED

Beverley.—Corporation. Installation of electricity in 135 pre-war Council houses (£3,386).—R. Hale & Co. (Electrical), Ltd.

Birkenhead.—Education Committee. Electrical installation work at Prenton Primary School (£2,053).—F. Hancock.

Dagenham.—Highways and Works Committee. Supply and erection of 103 Group "B" street lighting units on the Marks Gate estate (£2,479).—Eastern Electricity Board.

Durham.—County Education Committee. Electrical installation, Tow Law County Infants' School (£1,628).—North of England Engineering and Electrical Co.

Edmonton.—Corporation. Improved lighting of North Circular Road from Chingford boundary to west of Dysons Road, with G.E.C. lanterns (£3,651).—Eastern Electricity Board.

King's Lynn.—U.D.C. street lighting equipment, Wisbech Road.—Cohen Bros. (Electrical), Ltd.

London. — HACKNEY. — Housing and Town Planning Committee. Recommended. Two lifts for the Rutland Road housing scheme (£4,298).—Express Lift Co., Ltd.

Metropolitan Water Board Works and Stores Committee. Two 250 kW mercury-arc rectifier equipments at the Stoke Newington Works (£8,269).—G.E.C.

Stoke-on-Trent. — City Council. Recommended. Fluorescent street lighting in Stafford Street, Miles Bank and Fountain Square, Hanley, and in Wedgwood Street and Swan Square, Burslem (£2,054).—Revo Electric Co., Ltd.

Thurrock.—Street lighting installation. —Cohen Bros. (Electrical), Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alresford (Hants).—New factory premises; Gush & Dent, Ltd., engineers, New Farm Road.

Barnet.—Houses (100), Whitings Hill estate; U.D.C. surveyor, Ravenscroft House, Wood Street.

Barnsley.—Old people's residential home, Atherley North estate; borough engineer.

Bolton.—Mill extensions; Joseph Johnson (Bolton), Ltd., Deane Shed.

Dwellings, Green Lane estate (20), Toronto Street estate (40) and Crompton Fold estate (28); W. Lionel Gray (1933), Ltd., Hospital Buildings, Farnworth.

Brighton.—Flats (204), houses (35) and garages (16), Craven Vale estate; James Miller & Partners, Ltd.

Bristol.—Bank premises with offices on site in High Street; Bristol Trustees Savings Bank, 204, Stapleton Road, 5.

Cambridge.—Additional ward and occupational therapy unit at Fulbourn Hospital; Hughes & Bicknell, architects, Tunwell's Court, Trumpington Street.

Carlisle.—Assembly hall for the City Council (£18,000); city engineer, 18, Fisher Street.

Chester.—Newspaper offices and workrooms; *Chester Chronicle*, 27, Bridge Street.

Chesterfield.—Office block; Chesterfield Tube Co., Ltd., Derby Road.

Two classroom units at Hasland School and Peter Webster School; Wilcockson & Cutts, architects, 12, Saltergate.

Coalville.—Conversion of cinema into dance hall (£11,250); C. J. Deeming, Coalville, Leics.

Coventry.—Extension of factory; W. E. Jones (Tools), Ltd., East Street.

Crewe. — County training college; Pochins (Manchester), Ltd., King Street Works, Middlewich, Cheshire.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Dartford.—Factory premises; E. J. Churchill (Gunmakers), Ltd., 32, Orange Street, London, W.C.2.

Disley.—Houses (12), at Elizabeth Avenue site, for R.D.C.; C. & N. Riddick, Ltd., Charlesworth Road, Furness Vale, New Mills.

Doncaster.—Art gallery and museum, estimated cost £104,000 (work to start in 1955–56); L. J. Tucker, borough architect.

Dudley.—Houses (170), at Sledmore; Joseph Webb & Co., Ltd., 1, Ivy House Lane, Sedgley.

Felling (Co. Durham).—Office block for International Paints, Ltd.; company's architect.

Godmanchester.—Houses (20); G. B. Brudenell, Ltd., Cambridge Street.

Hendon.—Extensions and adaptations at the Technical College (£54,000); Middlesex county architect, 10, Great George Street, S.W.1.

Hornsea (Yorks.).—County secondary school (£100,000); East Riding county architect, County Offices, Beverley.

Houghton-le-Spring.—Factory addition, for Charles & Co. (Dresses), Ltd.; Mauchlen & Weightman, architects, Saville Row, Newcastle-on-Tyne.

Keighley.—Houses, Braithwaite estate (30); F. W. Heaton (Builders), Ltd., Oak Avenue, Bingley, Yorks.

Erection of new Baptist Church at Bracken Bank estate; Lunn & Lunn, architects, Milnsbridge, Huddersfield.

Kirkburton (Yorks.).—Houses (32), Lepton, for U.D.C.; T. V. Denton & Co., Ltd., 125, Crosland Road, Oakes, Huddersfield.

Leeds.—Block of offices at Headrow (£500,000); Princes Investments, Ltd., 22, Park Street, London, W.1.

London.—LEYTON.—Block of shops and flats; J. & J. Dean, Ltd., Ruckholt Works, Ruckholt Road, E.10.

POPLAR.—Shops and maisonnettes, St. John's area; borough engineer.

Loughborough.—Twelve houses for Town Council; F. R. Roper & Co., Holmfield Avenue.

Luton.—Factory extensions; Enn-Bee (Luton), Ltd., Cardigan Street.

Manchester.—R.C. school at Wythenshawe estate; Greenhalgh & Williams, architects, 15, Mawdsley Street, Bolton.

Mansfield.—Extensions to premises at Pelham Street, for Midland Box Co., Ltd.; H. Baggaley, Ltd., Baums Lane, Mansfield.

Newbiggin (Northumberland).—Central bakery, Woodhorn Road, for Newbiggin Industrial and Provident Society, Front Street.

Newport (Mon.).—Houses (175), St. Julians North; borough architect.

North Riding.—Infants' school, Eston South Bank (£33,000); Fordy & Son, builders, Boathouse Lane, Stockton-on-Tees.

Northumberland.—Headquarters for the fire brigade and firemen's houses, Morpeth (£82,500); child welfare centre, Bedlington (£12,400), and aged people's hostels, Blyth (£27,500) and Wallsend (£27,000); county architect, County Hall, Newcastle-on-Tyne.

Ossett.—Houses (40), Westerfield site, for U.D.C.; Ossett Federation of Building Trades Employers.

Oxford.—Flats (48), Barton End; Y. J. Lovell & Son, Ltd., builders, Marsham Lane, Gerrards Cross.

Peterborough.—Works extensions; Mitchell Engineering Co., Ltd., Glebe Court.

Flats (80) and eight houses to complete Dogsthorpe North estate; J. W. Barber & Sons, Ltd., Church Street, Stanground, Peterborough, and Charles W. Shelton, Ltd., Eastgate, Peterborough.

Plymouth. — Rebuilding Methodist Church Institute, Devonport; V. C. L. Saunders, architect, 1, Sussex Street.

Factory; Dent Allcroft & Co., Ltd., Oakfield Terrace, Prince Rock.

Redditch.—Extensions to County High School (£140,000) to form technical and grammar school; D. W. Sharpe, deputy architect.

Rugby.—Block of offices in Lawford Road; Bosworth & Wakeford, Ltd., contractors, New Street, Daventry.

St. Neots.—Houses (40), Eynesbury; U.D.C. architect.

Sedgefield.—Houses (130), Wood Lane, Ferryhill, for R.D.C.; C. M. Yuill, Ltd., builders, Villiers Street, West Hartlepool.

Sheffield.—Re-erection of war damaged flats at Croft Buildings, Townhead Street; Mansell Jenkinson & Son, architects, 18 Norfolk Row.

Smethwick. — Rebuilding factory; Tongue & Locker, fender moulding works, Grove Lane, Smethwick, Birmingham, 40.

Southall. — Houses (20), Norwood Green; Geo. Moss & Sons, Ltd., builders, Lady Margaret Road.

Southampton.—Infants' school, Ludlow Road, and junior and infants' school, Mansel; borough architect.

Stafford.—Four shops, 14 flats and 10 houses at Rickersote estate; Wm. Whittingham, Ltd., Ettingshall Road, Wolverhampton.

Staffordshire.—Second section of Walsall and Staffordshire Technical College (£120,495); J. & F. Wootton, Ltd., builders, Bloxwich, Walsall.

Stevenage.—Factories, New Town Industrial Area; D. P. Reay, architect, Aston House.

Stockton - on - Tees. — Houses (99), Roseworth estate; borough architect, 28 The Square.

Stoke-on-Trent.—Extensions to works in Registry Street; Wiltshaw & Robinson Ltd., Copeland Street.

Stourbridge.—Houses (146), on the Pedmore Fields estate, and pair of shops on the Wollaston Farm estate; G. N. Maynard, borough surveyor, Council House.

Stretford.—Extensions for Kelloggs of Gt. Britain, Ltd., Park Road, Trafford Park; Pochins (Manchester), Ltd., King Street Works, Middlewich, Cheshire.

Sunderland.—Factory additions, Durham Road, for Mayfair Products, Ltd.; G. T. Brown & Son, architects, 53, Fawcett Street.

Civic Hall (£66,000); borough engineer.

Extensions to works, South Hylton; T. G. Foster & Co., engineers.

Dental unit at Sunderland General Hospital for Newcastle Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne; Board's chief architect.

Surbiton.—Church hall, Balaclava Road; Young & Hall, architects, 9, Southampton Row, W.C.1.

Sutton - in - Ashfield.—Houses (74), Carsic Lane site, for U.D.C.; M. D. Sweeney & Palmer, Ltd., Beechdale Road, Aspley, Notts.

Wallasey. — Secondary Technical School for Boys, Mosslands Drive; borough architect.

Warrington.—Home for aged persons at Orford estate; borough engineer.

Wirksworth.—Factory for Hitchin, Daley & Co., Chevin Road, Milford, Notts., at Derby Road; J. Bakewell, architect, 25, Chapel Street, Bakewell.

Worthing. — Reconstruction of war damaged showrooms and offices; Caffyns, Ltd., Chapel Road.

Non-Ferrous Metals in 1953

Information received from the British Bureau of Non-Ferrous Metal Statistics (132, Hagley Road, Birmingham, 16) shows that at the end of last year stocks of metal in the United Kingdom were as follows:—Blister copper 18,098 long tons; refined copper 37,246 tons; imported virgin lead 21,762 tons; English refined lead 5,125 tons; zinc in concentrates 45,731 tons; slab zinc 27,652 tons; tin 3,085 tons (excluding "strategic" stocks).

The gross output of unalloyed copper products in 1953, with the 1952 figures in parentheses, was as follows:—Wire 143,068 tons (192,299); rods, bars and sections 12,123 tons (14,020); sheet, strip and plate 44,414 tons (53,854); tubes 36,855 tons (47,161); castings and miscellaneous 6,000 tons (6,000). The output of alloyed copper products was as follows:—Wire 12,211 tons (16,541); rods, bars and sections 96,530 tons (126,825); sheet, strip and plate 107,829 tons (130,476); tubes 16,848 tons (18,724); castings and miscellaneous 50,093 tons (66,306); copper sulphate 44,815 tons (58,508). The total copper content was 203,543 tons (258,465).

Lead consumption last year amounted to 303,753 tons; the largest consumer was the cable making industry (30 per cent, 91,091 tons). The consumption of the battery industry (excluding oxides) was 28,089 tons or 9·3 per cent.

Rubber Output and Consumption

Advance information received from the Secretariat of the International Rubber Study Group shows that the production of natural rubber last year amounted to 1,717,500 long tons. The consumption (including estimated imports of 41,850 tons into Russia and 56,750 tons into China) was 1,565,000 tons. Stocks at the close of the year totalled 860,000 tons. Synthetic rubber output was 935,000 tons and consumption 867,500 tons; stocks at the end of the period stood at 197,500 tons.